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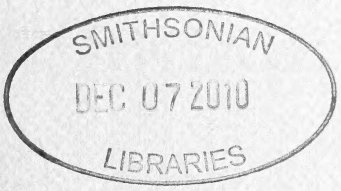

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The Russian Expedition's Sydney Visit in 1820 and Some Forgotten Blue Mountains Names

DAVID F. BRANAGAN

Abstract: The scientist Fedor Ivanovich Stein and the artist Emelian Karneev, members of the Russian Expedition, in Sydney in March 1820, had a brief journey into the Blue Mountains, in company with the explorer William Lawson and the botanist Allan Cunningham. Impressed with the mountain scenery Stein named a few localities for European savants, some of the earliest so named in Australia. These names never became recognised. Karneev's sketches, some of the first made of the Wentworth Falls locality, are apparently lost. Stein's report of the journey, a mixture of fact and scientific oddities, is presented in English for the first time.

Keywords: Russian Expedition, Blue Mountains, Stein, Karneev, lost sketches, 'lost' names

INTRODUCTION

On the morning of 2 March, 1820,[1] the citizens of Sydney awoke to find a strange ship in the harbour. There was some excitement, because this small outpost of the British Empire was very isolated, and unexpected visitors were always welcome. They provided a fresh topic for conversation, news from the outside world, and likely profit for local merchants hopeful of doing business.

It was quickly ascertained that the ship was the Russian sloop-rigged transport *Blagonamerenny* (*Well-intentioned*) under the command of Lieutenant Gleb Shishmarev (1781–1835). Several days later its companion, naval sloop *Otkrytie (Discovery)*, dropped anchor alongside.[2] These ships, under the command of Mikhail Nikolaevich Vasiliev (1770–1847), were the northern party of the exploring expedition led by Admiral Faddei Fadeevich Bellingshausen (1778–1852).

The ships had left Kronstadt on 17 July 1819, Emperor Alexander 1 (1777–1825) having visited the vessels before the departure. He stressed the importance of the research they were undertaking, telling them: 'the state which has strong science is a strong state'. They were to examine the high latitudes of both hemispheres – study astronomy, the atmosphere, wind variations, tornadoes, observe meteorites, northern lights, eclipse events, marine ice, icebergs, ocean currents, temperature, density and sea water salinity, make mineralogical, zoological and botanical collections and even more! (Debenham, 1945, vol. 1, pp. 23–29).

For the northern party the Academy of Science sent Pavel Tarkhanov to make astronomical observations. Fedor Ivanovich (Friedrich Wilhelm) Stein, sometimes written Shtein (died c. 1845), said to be 'a disciple of the famous Werner', was named surgeon/naturalist to the expedition (on board *Blagonamerenny*), not least for his supposed expertise in mineralogy.[3] Academician Emelian Mikhailovich Karneev (1778 –1839) was artist.[4]

[1] The dates given in this paper are according to the Gregorian Calendar. The Russians held to the Old System (Julian) Calendar until 1917. The arrival was noted in the *Sydney Gazette* 4 March 1820. In the original report by Stein the dates are given according to the earlier Julian Calendar, the inland expedition said to date from 22 February.

[2] The ships were soon separated. *Blagonamerenny*, through Captain John Piper (1773–1851), was moored off Pt Piper. In fact it was so close that those on the ship could hear, (but probably not understand) conversations in Piper's house. *Otkrytie* was anchored near the north shore.

[3] Barratt (1988, p. 139), where he comments that Stein was a graduate of Dorpat University (modern Tartu, Estonia).

[4] Karneev (Korneev in Barratt 1988) was the subject of considerable research by Barratt (1988, pp. 102–106), outlining his early life and listing the sketches made by the artist in New South Wales (see Table 1), but confirming that the sketches have not been located in Russia.

Campbell Tableland in the Blue Mountains of New Holland *
Crested Parrot from New Holland
Ornithorhynchus from New Holland
Ornithorhynchus
Blue Mountains Parakeet
Blackbirds of New Holland
Sun-Fish or Prickle-Fish
Varieties of Diodon
Medusa in New Holland
Clothing and Weaponry of the Natives of New Holland
Alca arctica or Marine Parrot
Nocturnal Gathering of New Hollanders
Continuation of a New Hollanders' Dance
Levson's [i.e. Lawson's] Cave *
A View of Port Jackson in New Holland
View of Prospect Hill, Property of Parramatta Commander Levson, 10 English miles from Parramatta
Castlereagh Hamlet, 16 English miles from Parramatta
Waterfall known as Prince Regent's Falls *
Large Cascade in the Blue Mountains of New Holland, known as Campbell Falls, 75 English Miles from Port Jackson *
Kangaroo Dance, at Night, Dance of the Natives of New Holland at Port Jackson
Dress of the Natives of New Holland
Ford across the Nepan [Nepean] River at the Settlement of Emu at the Foot of the Blue Mountains *
Varieties of Ornament and Weaponry of the Natives at Port Jackson
Large New Holland Bunting
Port Jackson
The Indian Fig-tree in Port Jackson

Table 1: List of Karneev's New South Wales Sketches, from Barratt, 1988, pp. 105, 106, included in two portfolios. The list shows how carefully Karneev attempted to fulfil the instructions he had been given. The five sketches asterisked are those most relevant to the expedition. A quarter of the 101 drawings submitted to the Admiralty were of New South Wales subjects, indicating Karneev's interest. Note: the attempted sketch from the west side of the Hawkesbury River at Windsor was apparently not included.

Emilian Korneev seems to have been quite an accomplished painter. An aquatint by P.C. Coqueret (1761–1832), c. 1800, after a Korneev watercolour has survived, as have a reproduction of an engraving of 'Laplanders' on a porcelain plate (c. 1809–1817), and an old engraving of a Vishnaite ceremony in Astrakhan, now in an Estonian Church (Information from internet sites). Barratt quotes a Russian source that indicates Karneev asked for funding to publish a 'Voyage' with engravings, but was refused. The Lapland item is illustrated on page 19 of a catalogue *At the Tsar's Table: Russian Imperial Porcelain* from the Raymond F. Piper Collection, June 1 – August 19, 2001, Exhibition organised by the Patrick and Beatrice Haggerty Museum of Art, Marquette University, Milwaukee, Wisconsin. Catalogues and Gallery Guides. It is available at: `http://epublications.marquette.edu/haggerty_catalogs/18/` (Website accessed on 14th September 2010).

His orders were stated as:

... the graphic artist must make sketches of any notable place, drawings of the natives, of their dress and amusements ... and at the end of the mission deliver the results to the Commander, who must submit all the material, without reservation, to his Majesty through the Minister of Naval Affairs (Debenham, 1945, vol. 1, p. 27).

The provision of specialist naturalists for the two parts of the expedition had proved somewhat disappointing. Two Russian students of botany and zoology were rejected, much to Bellingshausen's regret, because two 'learned German scientists' were supposed to join the expedition at Copenhagen. However they failed to make an appearance.[5] Arrived at Portsmouth, even the efforts of Sir Joseph Banks (1743–1820) could not produce a British scientist to join the expedition, so this work fell on the shoulders of such as the surgeon Stein (Fitzhardinge 1965).

After a pleasant visit to Rio, where the Russian consul, the German Georg Langsdorff (1774–1852), a good friend of Bellingshausen, saw to their comfort, the expedition ships had difficult rough conditions, voyaging via Tasmania to Sydney. The ships *Blagonamerenny* and *Otkrytie* remained at Sydney until 28 March, then travelled north to Bering Strait. Two weeks later (11 April, 1820) Bellingshausen himself arrived in Sydney on the *Vostok* (Barratt, 1979, p. 51). On board was Professor Ivan Mikhailovich Simanov (1794–1855), of Kazan University, the young but apparently already notable astronomer, who was studying the Earth's magnetic field. Simanov was given permission by Governor Lachlan Macquarie (1762–1824) to set up an observatory for transit measurements at Kirribilli Point on the north side of the harbour.[6] Paul Mikhailov (1786–1840) was artist.[7]

The welcome accorded the Russian visitors was genuine, but Macquarie was aware that the Russian rulers had ambitions, and wrote to tell his superiors in England about the visitors. Fifteen or twenty years later, British authorities began to worry if Russia, with all its various expeditions, was wanting to become a stronger power in the Pacific. From that time the lonely British outpost of Sydney, with its outstanding harbour, lived in fear of an invasion by foreign powers, and Russia was among these supposed enemies! (Barratt 1979, Hotimsky 1958).

From a geological viewpoint some of the Russians visitors recorded minor matters, such that the Governor's house was constructed of 'soft white stone', and they saw 'New Holland sandstone' being cut for the 'beautiful new barracks'. Taken by Macquarie to Parramatta and Windsor they heard 'horrid stories' of Hawkesbury floods and, in contrast, the inadequacies of the local water supply. They were particularly impressed by the good soils of the Hawkesbury region (Fitzhardinge 1965). Vasiliev (1823) covered some of these aspects in 'Remarks on New South Wales' included in his official report of the expedition.

A RELATIVELY FORGOTTEN ASPECT

General aspects of the Russian visits are well enough remembered (see e.g. Fitzhardinge 1965), although little was published even in Russia on the Northern Expedition, which was overshadowed by Bellingshausen's Antarctic and Pacific adventures. However one specific activity of the Northern party's visit has been largely forgotten, or has received only brief mention. This is the short scientific expedition to the Blue Mountains, carried out by two members of the earlier party (Vallance 1975, p.

[5] The intended scientists were Karl-Heinrich Mertens (1796–1830) of Halle and Gustav Kuntze (1793–1851), or Kunze according to Barrat 1988, p. 128. (Debenham 1945, vol. 1, p. 12).

[6] The Russians set up a shore camp nearby. This position, probably correct, is given by Debenham (1945). Debenham's publication deals almost entirely with the exploits of Bellingshausen's two ships and their work in the Antarctic and Pacific region, which overshadowed the northern expedition. This party's earlier arrival in Sydney is one of the few mentions. The results of the Northern expedition were essentially ignored and few publications ensued in the nineteenth century.

[7] A fine painting of Sydney and the Harbour from the North Shore by Mikhailov was reproduced in colour as the frontispiece to De Vries: *Historic Sydney: the Founding of Australia* (1999). It appeared in black and white in Barratt (1979, opposite p. 33).

18; Branagan 1985, p. 8). Local comment about this expedition came essentially from references to the botanist, Allan Cunningham (1791–1839) participating, although his own record of the journey was not well known. For instance Froggatt (1932, p. 115) made a brief, but inaccurate mention that '[Allan] Cunningham spent the first half of 1820 in New South Wales accompanying some Russian naturalists over the Blue Mountains.' McMinn (1970, pp. 142–143) gave more information on the expedition:

Cunningham arrived back from the King voyage on 12 January 1820[8] *still rather debilitated by his illness and the hardships that followed it, he worked slowly at the routine of preparing specimens and reports for Kew until March, when he felt strong enough to act as guide to the Russian naturalist Stein and his artist-assistant Karneyek [sic] who were then visiting the colony and wished to make a short trip into the Blue Mountains. Remembering the kindness of the Russian consul in Brazil, he was prepared, if necessary, to pay the expenses of the journey from his own resources.*[9] *Stein and Karneyek found his generous help extremely useful.*[10]

To repair the northern party ships and obtain provisions would take some weeks. Governor Macquarie therefore gave Tarkhanov permission to set up a shore observation point to correct the ship's chronometers.[11] In addition, with Macquarie's agreement, Commander Vasaliev directed Stein, and the artist Karneev, to take a journey inland to the Blue Mountains, but only for twelve days, departing on 6 March. Aurousseau (1972) gave a brief review of the information concerning this expedition, and covered some of the aspects of the expedition. While he commented (Aurousseau to Vallance, unpublished correspondence, in the author's possession) that he had translated from the German version of the report written by Stein into English it apparently was never published. T.G. Vallance, mentioned by Aurousseau (1972), had identified the source of the original report as the *Schriften* of the Royal Russian Mineralogical Society of St Petersburg, Vol. 1, 1842, 143–162, entitled (in translation) 'Mineralogical Remarks on a twelve day trip from Sydney (New South Wales) to the so-called Blue Mountains'. It had appeared first in 1830 in Russian (Stein 1830).[12] In a recent internet article on the expedition V. Kroupnik (2009) suggested that, although Stein's report was not suppressed, it was not widely promulgated. He wrote:

Shtein's work failed to win any recognition in Russia. In those times the Russian Scientific geology was under the pressure of censorship and works one way or another dedicated to the evolution of the Earth practically were not published as contrary to the religious postulates.

This statement, adapted from Barratt (1988, 141), who goes even further in suggesting censorship on religious grounds, does not quite fit with the fact that Stein's report was published, but the lack of recognition was more likely allied to the quality of the report, as commented upon later in the present paper. However a summary of Stein's report was included in Vasiliev's report presented in 1823. Barratt (1988, p. 103), based on A.P. Lázarev, (1950, p. 27) suggests it was Stein's idea that the Blue Mountains were quite ancient, geologically, and that he was 'anxious to confirm this by analysis and observation on the spot'.

Among T.G. Vallance's manuscript papers, passed on to me, are copies of a full translation into English of Stein's report and translation of portion of the report by Dr A. Slanska. The former, handwritten, is said to be 'from the German manuscript[13] by Mr Stein translated by Ordinary Member A. Deykhman,' This al-

[8] For the King voyages, and Cunningham's involvement, see Branagan & Moore (2008) and Curry et al. (2002).

[9] Cunningham Journal Tuesday 7 March 1820, Archives of New South Wales Microfilm 46.

[10] Cunningham to Governor Macquarie 7 March 1820, Archives of New South Wales SZ 13.

[11] Kroupnick (2009) says that a 'smithy and maintenance workshop' was also established.

[12] Copy in possession of the author. An abbreviated version of Stein's report was published in Lázarev (1950).

[13] The term 'German manuscript' might suggest that an original handwritten copy of Stein's report exists, but it seems more likely that the word 'manuscript' is used here loosely to refer to Stein's published German report of 1842.

most certainly refers to translation from Stein's German into Russian, rather than into English.

Since the presentation of this paper for publication a typescript copy of Aurousseau's translation, together with copies of Stein's German and Russian versions of the Blue Mountains Expedition have been located in Vallance's papers. Aurousseau's translation differs only slightly from Slanska's, mainly in style, so the Slanska version is presented below. The German version allowed me to verify some points in her translation. The material related to the expedition in the Vallance papers will be offered to the Mitchell Library, Sydney.

While Aurousseau had expected that Vallance would take up some of the geological problems inherent in Stein's writing this was never done *in extenso*. Brief comments from Stein's report were mentioned in Vallance and Branagan (1976, p. 7), and these were supplemented in Vallance (1976) by an abstract in Russian from Stein's report and translation of the abstract by Slanska (mentioned above). Barratt (1979, pp. 46–49) gave a précis of the expedition. He might have translated the complete report, but the only direct quotation he gives from the Stein manuscript refers to matters concerning coal at Newcastle, and agrees quite closely with the translation in the present paper (Barratt, 1988, p. 141, and see later). Consequently the present paper seems to be the first to present Stein's report fully in English.

In many respects the report is an extraordinary document, an odd mixture of fact and fancy, and deserves to be available to historians of science. The report mentions that the artist Karneev made numerous sketches (see footnote 3), but searches by Russian colleagues, particularly in St Petersburg, in the past few years, have not unearthed what would be a fascinating record, (but see further below).

Russian historians of science were reminded of this expedition in a presentation I made at St Petersburg in 2002, and a paper, based on this presentation, including much of Stein's report was published, in Russian (with my comments translated by G. Anastasenko and others) (Branagan 2005).

The Stein report is presented in full, in English, below. I have made some minor changes from the handwritten copy (from the Vallance papers) and from notes provided by Dr Anastasenko, to improve the flow, without, I hope, changing the meaning. Some points are amplified in footnotes, but a fuller discussion follows.

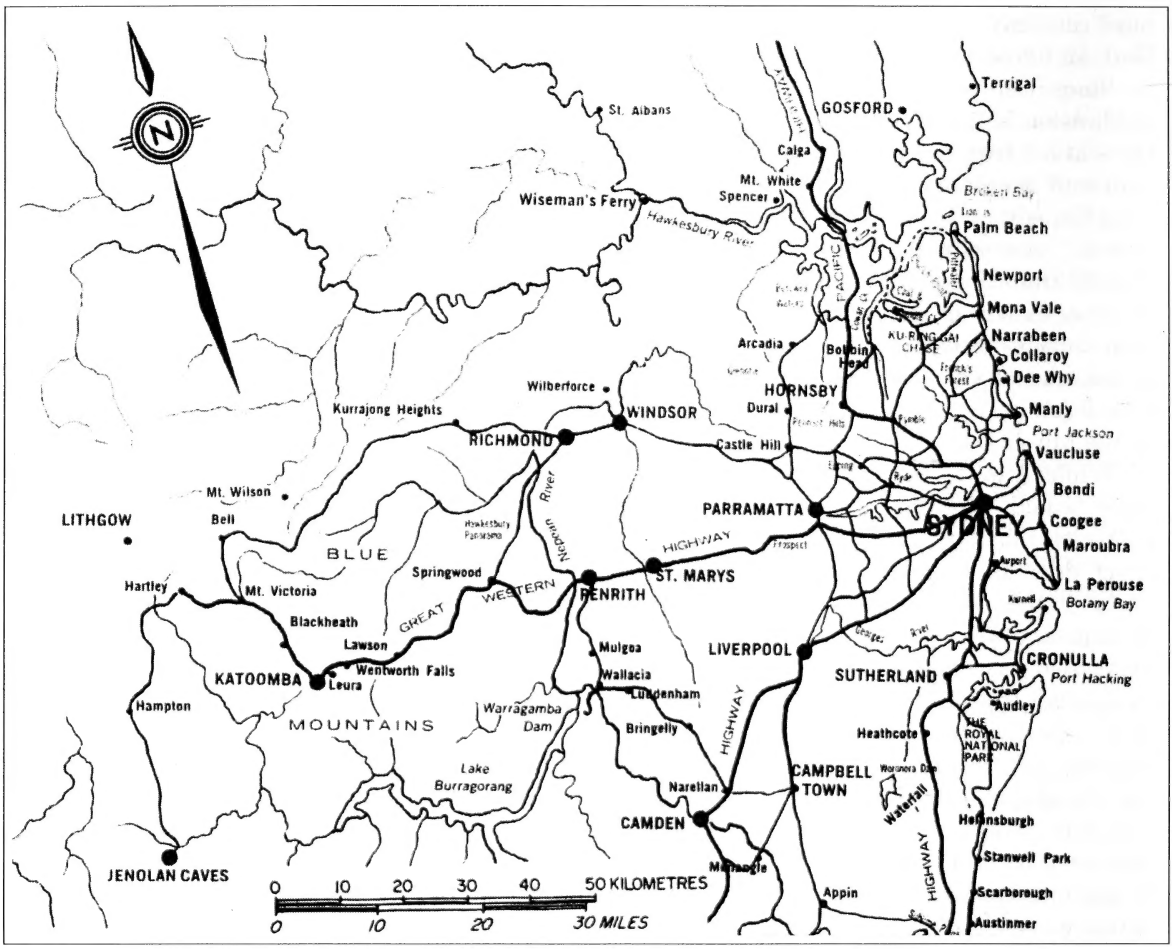

Figure 1. Map of the Sydney region showing the places visited by the Russian party.

MINERALOGICAL REMARKS ON A TWELVE DAY TRIP FROM SYDNEY THROUGH PARAMATTA [SIC] TO THE SO-CALLED BLUE MOUNTAINS

From the German manuscript by Mr Stein, staff surgeon.
Translated by ordinary member A. Deykhman.

The head of our expedition Lieutenant – Captain and Knight Vasiliev, having obtained from Mr Macquarie, Governor-General of All English New South Wales and Van Diemen colonies permission to visit the Blue Mountains, on the 22 February [5 of March 1820][14] *ordered me and the expedition's painter, Mr Karneev, to travel there from Sydney.*

The governor-general with great courtesy and consideration supplied us with travelling necessities and letters of recommendation, and further with two riding horses especially for us, one pack animal for our luggage and his driver as a guide.[15] *Being thus prepared for our trip in all respects we set out.*

As far as Paramata [sic] we were accompanied by the governor-general's adjutant[16] *and from there to the Blue Mountains by Mr. Lawson, the commandant of Paramata and all settlements on both sides of those mountains*[17]

The town of Sydney is situated partly rather high above Sydney Cove, partly on low-lands of two estuaries forming Port Jackson which are suitable for the anchoring of both military and commercial (merchant) vessels. The town itself is guarded by two bastions of which the eastern one is built of grey and yellow–white sandstone, occurring on the cape[18] *The western is situated on the outer extremity of Sydney Cove being rather elevated and commands all directions.*[19] *The Cape is of sandstone beds, which are cracked hereabouts and form flat tops narrowing towards the north-east and extending a considerable distance being terminated by a spur covered during high tide. Sand and also occasional clay deposits with a small amount of chernozem [soil] cover the bed which is only locally visible as protruding large sandstone blocks. Towards the east and the south from the cape, the sandstone extends [rising] in small step-like elevations forming the Surrey Hills and continuing to the sea coast and Botany Bay. Only on the sea coast are visible cliffs of sedimentary formations more than 1000 feet high.*[20] *The base of all the visible beds is composed of a more or less thick layer of sandstone which seems to constitute the main rock of the coast area of New Holland. In this layer occur alternate clay-rich, iron-rich and plate-like sandstones. The clayey and iron-rich sandstones are associated with sieve-like*[21] *micaceous and cavernous or vesicular sandstone. These features are particularly visible on the banks of Port Jackson and in the upper part of the beds of Surrey Hills. The entire eastern coast of New Holland seems to be formed of sandstone beds, and there are traces of coal measures [seams?].*[22]

[14] See fn 1. In the report by Stein the dates are given according to the earlier Julian Calendar.

[15] The driver is not identified. He gets no further mention in any records of the journey and it is possible he did not remain for the whole journey. Nevertheless, as with Charles Darwin's 1836 journey to Bathurst this companion was probably 'just a nobody'.

[16] Hector Macquarie (d. 1836), Governor Macquarie's nephew (see Ritchie 1986).

[17] Lawson was appointed commandant of the settlement of Bathurst in 1819, which position he held until 1824. Lawson lived at 'Veteran Hall', Prospect, and rode to Parramatta to meet the Russians. Only the year before (1819) Lawson had taken a group of French scientists (of Freycinet's expedition) over the Blue Mountains, and the French had been aware that Lawson was not enthusiastic about the journey, as early as Emu Plains Lawson suggesting that they abort the expedition, although they noted he was courteous to them (Havard 1938).

[18] The present site of the Sydney Opera House.

[19] Dawes Point.

[20] This is something of an exaggeration, the maximum elevation is about 120 m.

[21] The term is underlined in the original; presumably meaning 'open', loose-grained sandstone.

[22] Early travellers sailing north along the New South Wales coast could easily have gained this impression, seeing sandstone cliffs in the vicinity of Eden and then almost continuous cliffs from near Batemans Bay to Sydney (and beyond Newcastle). Although there are occasional plant fragments and pieces of coalified fossil wood in the Sydney sandstones Stein is probably referring to outcrops of dark grey shale, occurring as thin layers within the sandstone beds of the Sydney region.

The local sandstone, younger as well as older, is usually various shades of red, grey and white. The size of its components is variable, the grain being of lentil size, pea size, egg size, but sometimes the rock passes into conglomerate as is the case on the banks of the South and East Creek[23] *In the Surrey Hills coarse and fine-grained sandstone occur. Along the road to Paramata it is developed as thin, mottled, brown, brick-red, ochreous and white undulating beds. The bottom is formed probably by clayey ironstone. In many places it seems to be made of layers from one archime [28 inches] to several sah [?yard] thick*[24] *For the most part it is horizontally layered and seldom has a dip (as at Landstone Hill)*[25] *On the coast of Green, Garden and several other islands, in Port Jackson, it is entirely fractured.*[26] *On some of these islands the [?] slate-like sandstone is cracked to such an extent that it is hardly of any use.*

Locally it forms high almost inaccessible steep slopes but also sometimes gently sloping rounded hills. On the northern shore of Port Jackson and particularly at the [harbour] entrance there are colossal, quite perpendicular or extensive cliff-like bare walls. Around Paramata and Sydney many sandstone quarries yield building material for houses, mills, garden walls, lining of ditches (gutters, sewers), bridges etc. Quite frequently, we were told, fossil shells are found in it.[27] *On the sea coast at the height of more than 100 sazhen [yards], time has uncovered (disintegrated) some parts of the sandstone and thus exposed to the curious observer an entire museum of the ancient world which unfortunately cannot be seen closely because of the steepness of the cliff.*

In one bay of Port Jackson, not far from the location of our observatory, opposite Sydney, Mr. Zaozerskoy, the staff-surgeon, found during low-tide two quite big rib bones. According to the nature of these bones (since the external as well as internal composition was damaged) we concluded that they had been in water for a long time. The bone ends were absent, and they were covered thickly by shells and oysters. It is possible that these ribs belonged to some ancient animal and were washed out by water from the coastal sandstone. This occurrence should be considered as an uncommon phenomenon in New Holland, as up to now no animal had been discovered to which these ribs could be attributed.[28]

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[23] Probably Eastern Creek, west of Prospect. South Creek is further west, near St Marys. Stein is possibly referring 'conglomerate' to younger coarse gravels, often silicified, of Tertiary age, although later comments in the report suggest he saw these as independent from the older sandstones, which can be conglomeratic in patches.

[24] Stein probably is referring here to shaly rocks of the Wianamatta Group which overlie the Hawkesbury Sandstone.

[25] Landsdowne Hills, the general area on the west bank of the Nepean, south of the Grose River named by Governor Phillip in 1788 (*Historical Records of New South Wales* Part 1, Vol. 2, p. 133). Stein is probably referring to Lapstone Hill (the present Old Bathurst Road) within the then-named Lansdowne area, marking the eastern edge of the Blue Mountains, where the rocks are steeply inclined. The term Landsdowne is not used today.

[26] Probably referring to a shatter zone (see Branagan 2000, pp. 45–52).

[27] The sandstone is not of marine origin. Stein is probably referring to recent shell beds marking the sites of aboriginal middens, which were abundant in the Sydney area.

[28] Gregorii Zaozerskiy was on the *Blagonamerenny*. The bones were almost certainly not true fossils derived from the sandstone, although it is not impossible, and their identity [? Marsupials remains] does not seem to have been followed up by the expedition's naturalists. W.J. Stephens (1887) reported perhaps the first vertebrate fossils found in the local Hawkesbury Sandstone, at Cockatoo Dock. Fossil fish were found in the following years at a number of sites of shale beds within the sandstone. According to Barratt (1979 p. 49), relying on Lázarev (1950 p. 154), the bones were taken on board *Blagonamerenny*. The Stein specimens were apparently put on 'unfrequented shelves at the Academy of Sciences' Kunstkammer' when the expedition returned to Russia, and remain unexamined (Barratt, 1988, p. 142; Barratt, 1982).

The external surface of the local near-surface sandstone is entirely porous and leached. This phenomenon can be particularly observed on the western and south-western facing exposures and in such cases should be attributed to the rains. However, at South Head in the vicinity of the lighthouse, and at Surrey Hills there can be seen many different shallow caves. Sometimes our steps caused a sound that can be heard when walking over hollows. The roofs of many of these natural cavities have already collapsed. Those that remained were so thin that it was not without danger to walk on them.

These caverns are wide at the front but become narrower towards the back. Considering this, one can assume that their formation is primary in the stone and that they were probably receptacles for the solutions that had accumulated in the rock[29] *At Paramata, on the banks and river beds of running waters, the sandstone passes into sandy slate and in many places they are interbedded with a transitional clay slate and greywacke slate.*[30] *Gravel and clay slates overlie these rocks and on them a p[?rofile] of several feet thick chernozem has developed.*

From Sydney, as far as the vicinity of Paramata, the hills are usually flat and slightly sloping, but further [west] they start gradually to rise and form a rather smooth plain on which the main part of [the] colony is regularly spread. The closer to the Blue Mountains, beyond Prospect Hill and Windsor across South and Eastern creeks, there is a rising, stepwise hilly area, becoming gradually higher and higher. It is traversed by many gullies orientated in different directions filled up, especially in times of rain, with water. In the neighbourhood of Prospect Hill there are granite and gneiss, porphyry and syenite units to be seen, in quarries in which mil[l]stone is exploited. Thus these three last named rocks are known in New South Wales under the name mil(l)stone[31]

The alluvial sediments seem to be developed at Windsor and also in the hills and extensive plains on either side of the Nepean and Hawkesbury Rivers, but particularly in the right riverbanks of these rivers.[32] *Here the primary rocks are covered with a few fathoms of clay stone and sandstone, and also pebble conglomerate and the clay-slate shingle alternating with quartz-shingle, which lies directly in part on the primary clay-slate, and partly on highly ferruginous clayey sandstone*[33]

In the valley on the southern side of Prospect Hill a few hundred paces from [the] Commandant's house[34] *there is a mineral spring containing*

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[29] Stein seems to infer (and imply) that these cavities were formed at the time of formation of the sandstone, but they were almost certainly the product of quite recent weathering and erosion ('honeycomb weathering').

[30] These are almost certainly the basal beds of the Wianamatta beds. The term 'slate' was, at that time, commonly used to refer to fissile shales.

[31] There is some confusion here, as it is not clear which three rocks types are being referred to. Stein possibly confused the information he was given. The rocks at Prospect are part of a complex intrusion which intrigued many early (and later) 'geologists'. Although neither granite nor gneiss, as we understand these terms, occurs at Prospect, Stein was referring probably to one of the many varieties of granite, as defined by Werner (Jameson 1808). Similarly 'gneiss' in Werner's scheme showed considerable variation, including being columnar, as shown by some rocks at Prospect. Similarly porphyry and syenite are discussed by Jameson (1808). Stein's considerable admiration for Werner is well seen in Stein's rock naming based on Werner's classifications. The Prospect intrusion is a laccolith (a complex 100 m thick differentiated sill of diabase-picrite), i.e. doleritic material of varied composition and appearance, of Jurassic age, intruding the Triassic succession, which has uplifted and altered the local sandstone. (Wilshire, 1967). Although the alteration does not extend a great distance into the shale and sandstone it was probably sufficient to produce hard and more compact altered sandstones suitable for millstones.

[32] The right, or eastern bank of the Nepean-Hawkesbury consists largely of a flood plain. The left or western bank is closer to the outcropping sandstone of the Lapstone structure.

[33] Stein apparently assumed that Primary or 'Primitive' rocks lay not too deep below the alluvium, based perhaps on the numerous boulders of igneous rocks and quartzites appearing among the consolidated gravel banks. These igneous and metamorphic rocks had been brought from the west and south by the Warragamba River and its tributaries, as noted by Cunningham (see entry under 13 March).

[34] Lawson's 'Veteran's House' 'a fine 40 room mansion built in early colonial style' (Dunlop, 1967) constructed about 1812.

sulphuric and hydrochloric salts[35] *The spring is so strong that in summer, it is said, the ground is covered with salt crystals. I am sorry that I could not collect some whilst I was there, however I received several bottles of the water through [the] Commandant, and I hope to carry out a complete analysis of it later on.*

As soon as you are out of Sydney, trees which are represented by shrubs and bushes [in the town] become transformed into hearty branching trees. Hills and dales look as if they had been sown with the rarest and choicest of timbers and a great number of other plants, most of which have fragrant leaves [and] are covered with the most gorgeous flowers. In other places the very rare Cholartes Stockhadis Brownii[36] *give out the sweetest of scents in the New South Wales bush.*

Swarms of parrots of the most gorgeous plumage live there and enliven the weary traveller with their squeaking. Emu Island as well as the plain and lowland at the foot of the Blue Mountains in time of rains are flooded and only then is so called Strauss-island[37] *a real island.*

In summer, or when drought sets in all the surrounding bush, creeks dry up and only its [?Strauss Island] eastern side is perennially washed by the Nepean River.

The settlement of Windsor on the right bank of the Hawkesbury River in wet weather looks like an island and the whole of [the] surrounding country, except for a few higher places, lies under water caused by overflowing of the Hawkesbury River and the Grose River. It is nevertheless one of the most fertile parts of New South Wales[38]

The Blue Mountains seen from a distance, e.g. from Prospect Hill (so called because of the fine view from it) look blue: they are wooded from foot to top. Only a small part of them, over an extent of two or three hundred English miles is as yet known. It is highly probable, that they are only part of a mountain region that stretches inland and joins probably the high granite mountain of Endeavour River in the North, through the many island[s] and reefs of Bass Strait with the high basalt mountains of Van Diemen's Land in the South. The high mountain of the Endeavour River, the Blue Mountains, and the high mountain(s) of Van Diemen's Land could possibly be junction points of this mountain chain. The Blue Mountains are partly mountains of moderate, partly low heights. They are the principal mountains of New South Wales[39] *they form narrow mountain chains, in places continuous, elsewhere disconnected. A few like Hat-Hill, Mount Taurus, and Macquarie Hill*[40] *are isolated, but [the] most part of them form close-spaced jostling ridges. The assumption of all geographers and geologists that there is an indirect connection between the mountains of the globe to the Cordilleras*[41] *may be applied to New Holland Mountains as follows: the mountain limbs and their lateral branches that spread out in divergent directions on all sides from the main junction area lead them northwards to the main mountain system of Asia through islands (submarine mountains) that lie between New Holland and Asia, eastwards through innumerable larger and smaller islands (New Guinea, New Caledonia, New Ireland, Louisiana [?Louisiades], Queen Charlotte Island, New Zealand, the New Hebrides, the Society Islands, the older and newer Friendly Islands, the isle of Pines and Botany Island, Kea [?] Pula [?Pulap, Caroline Isds], Buru Pala, Kode [?] Pula, Tethoura, Trubia, Palliser and Palmerston Islands [Cook Islands], Grenville, Casteret's [Carteret] Island, Sauvage and Further Island, L. How's and Auckland's groups, Kingsmills Group, Cocos Island, the Marquesas Island, [?]Pivish's group, Good Intentions group*[42]

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[35] The Prospect intrusion contains occasional veins and patches of sulphides (mainly pyrites, Fe_2S), which would have provided the acidic waters.

[36] *Cloanthes stoechadis* Br. (Harris 1971, p. 164 & plate. 12); the handwriting is probably misread.

[37] Not identified.

[38] The information concerning Windsor came, in part, from the travellers' visit there near the end of the expedition (see later).

[39] The character of the southern Highlands of New South Wales (Kosciusko region) was then unknown.

[40] Hat-Hill near Blackheath, Blue Mountains; Mt. Macquarie near Windsor, in the Parish of Gidley (Wells 1848, p. 271). Mt Taurus not identified

[41] Stein's suggestion that 'an indirect connection between the mountains of the globe' had been assumed by all geographers and geologists, was probably taken from Pierre L.A. Cordier's (1777–1861) work, for whom see Sarjeant, 1980, vol. 2 p. 764.

[42] This catch bag of Pacific islands, many of whose names have changed (see Langdon 1976; Craig & King 1981), seems to have been pulled together only to suggest their divergences of direction, and possibly Stein's vast knowledge of the Pacific region!

the Galapagos Island[s], Eastern [?Easter] Island and many others to the coastal cordilleras of North and South America.

All these islands must be regarded as submarine mountain chains, which in lateral ridges and lateral spurs, extend from the Cordilleras in various directions from East to West.[43] *According to Bauche*[44] *the mountains of New Holland and New Zealand etc. lie in the second south zone, between the first and the second southern parallels.*

Humboldt observed that the close correspondence in the foliation of primary rocks, granite and gneiss and particularly in mica and clay slates, was subjected to the general law, their spreading being 3 & 1/2 hours of the miner's compass (that is an angle of 25 & 1/2 South West to North East with the local meridian and the Earth's axis) and also the strike and dip of it (spreading) are independent of the set of the mountain slopes, and valleys have no influence on them, and according to my opinion this may be fully accepted for the Blue Mountains. It seems too, that [the cause that produced the primary rocks also produced the oldest sedimentary formations].[45]

The coal mountains of Newcastle may be regarded as arms of [the] Blue Mountains. They form hilly country broken up by numerous gullies; in the valleys one can observe cliffs and precipices. Coal-bearing formations here consist of slaty-clay (with innumerable plant impressions, particularly of reed-like plants),[46] *inflammable slate, usually micaceous conglomeratic sandstone, hardened clay, clayey iron-stone and common, somewhat indurated clay. The slaty clay contains fine flakes of mica and in the air it splits into friable clay. It is bituminous. Sandstone partly slaty and partly passing into a coarse breccia conglomerate lies immediately above the coal. [At Newcastle] several coal seams occur and about [?]five of them are being exploited. There are about 12 seams, the main seam being about 8 feet thick. Beds lie in [the] following order, from the bottom upwards: sandstone, slaty coal, then slaty clay, slaty coal, and so on. There are displacements commonly present, causing the development of fissures and veins, which are filled with a conglomerate, composed of quartz, slaty clay, and clayey ironstone*[47] *The dip of the beds is from 30–35° to SE*[48] *strike is in the hour 9.2. The coal seams which have been opened up here represent an immense deposition of botanical fossils; in slaty clay often stems and leaves of reeds occur; it is said, that something like cinnabar can be found there, but I had no opportunity of seeing it, so I leave this to others to confirm or deny it. Both auriferous and common pyrites either massive or crystallized occur near the coal seam or in it. Calcified shells and gypsum are also found.*[49]

The following kinds of coal are mined here: lumpy coal, laminated coal, and bituminous coal. According to the composition of it, one can assume, that in some cases the main component is Eucalyptus resinifera Smith[50] *but in other instances woody layers are found strongly resembling the layers of any resin-providing species are found. Thin layers of coal are also found in the coastal sandstone. In addition coal deposits also*

[43] Some belong on submarine ridges, but many are isolated. We know now that the east and west Pacific regions lie on different plates. For information on some of these places see Langdon (1976); Craig and King (1981).

[44] probably Philipe Buache (1700–1770), French Geographer, the first to use contour lines on a map.

[45] This sentence comes from Aurousseau's translation as Slanska's is not correct.

[46] The Newcastle coal deposits 'consist of schists and clays and contain incalculable quantities of plant, and, especially, reed-imprints' Barratt, 1988, p. 141.

[47] All this information on the coals and coal measures of the Hunter River north of Sydney is reasonably correct, but it is essentially second-hand, as Stein did not visit that region. He probably gained the information from Cunningham, and might have been able to examine some hand-specimens of the rocks. The presence of conglomerates closely associated with the coals is a particular feature of this coalfield, and is relatively unusual in coalfields. The so-called conglomerates of the fissures probably refer to brecciated, weathered basaltic dyke material.

[48] The great majority of the coal-bearing beds are horizontal or close to it.

[49] Pyrite and marcasite occur with some of the lower seams of the Hunter Valley. The shells and 'gypsum' possibly refer to young shell deposits as occur in the Sydney district, referred to earlier. However fossils in marine beds underlying the coal measures of the Hunter region are abundant.

[50] For a long time it was thought that the plant material forming the New South Wales coal was essentially the same as the present flora. From the late 1820s this was recognised as incorrect, but the correct picture did not emerge until well into the twentieth century.

occur in the layered trap formations, while bituminous and brown coal occur in the basalt mountains of Van Diemen's Land.[51]

The rocks from which the main features of the Blue Mountains are built belong mostly to the slates and traps.[52] *Porphyry and talc rocks are subordinate.*

Granite, gneiss, mica schist, porphyry, serpentine and syenite, primary trap (greenstone), quartzite schist, greywackes, greywacke schist, transitional clayey schist, sandy schist and basalt are the rocks of which the Blue Mountains are composed.[53]

Granite, both older and younger occur in the middle and mostly in the western part of the mountains. It is more or less equigranular, coarse fine grained with grey yellow-white and flesh pink felspars, which are usually well crystallized, but locally weathered into china clay.

Quartz is partly grey, partly milky white, always translucent and breaks down into coarse or fine grains. Mica is mostly fine, rarely occurring as coarse and small flakes, it is grey, black and silvery.

In granite tourmaline is an accessory mineral commonly present. Graphic granite (Piere Hebraique) is said to occur in the Bathurst district. In the so-called crystal vaults of the granite, rock crystal is found in larger or smaller cavities. Next to it I observed that fine grained granite with thickness about 1 & 1/2 to 2 feet alternates with coarse-grained granite, its strike being 3–4 hours and north-east dip. In the granite there are layers of quartz containing flakes of native gold, malachite and galena[54] *Both the so-called granite and half granite either form coniform hills from which all mountains are built or overlie clayey slate or gneiss. In addition fissured granite boulders and blocks are found in the vicinity of Prospect Hill, Windsor and in some other places. On many granite outcrops I have observed easterly, on others westerly declination of [the] compass needle.*

Gneiss some of it coarsely, some finely, some unevenly or evenly threaded is composed of pinkish-white feldspar, ash grey or greenish grey and sometimes of tobacco brown mica and greyish and yellowish white quartz. Feldspar is weathered in some places. As an accessory mineral precious and common garnet is found in it. On the left bank of the Nepean River I found rounded pebbles of fine-grained granite (4 to 6 inches in circumference), which was composed of yellowish feldspar, much quartz and without mica. The same was noticed by Humboldt on the Carguias [?Cargueros][55] *in South America and not far away from Valencia (Spain). The gneiss occurs in distinct stratification over granite and in outcrops its dip can be seen and foreign rocks like quartz, feldspar, common asbestos and hornstone are intermixed with it. It is fissured in all directions so that the rock walls about Springwood plunge strongly and here and there very rugged crags of gneiss are exposed.*[56] *Their age seems to be different, as the Blue Mountains, particularly those which are lying easterly (those which are lying westerly are strongly dipping to the west) are*

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[51] This sentence probably refers totally to Tasmania, where both basalt flows and sills of dolerite complicate the geology of the coal-bearing rocks in the eastern parts of the island.

[52] Stein, as a follower of Werner would have regarded trap, basalt, etc as of Neptunian origin, not volcanic.

[53] Some of these ideas might have come from specimens from the deep valleys of the western Blue Mountains and beyond, which Cunningham or Lawson could have shown Stein. Also he collected, or at least examined, some such rocks as pebbles on the Nepean-Hawkesbury. Nevertheless it is strange that Stein's ideas about the rocks of the Sydney region (the sandstones) are reasonably correct, but he rather 'goes off the rails' in the Blue Mountains, which essentially consist of sandstones.

[54] Stein's mineralogy expertise must have deserted him here. Stein was almost certainly in error is thinking he had found gold; it was almost certainly a variety of white mica that was present, the 'galena' possibly graphite. Likewise the copper ('malachite') occurrences were probably organic colouring found under rock overhangs. Perhaps Stein wanted to make a good impression and flaunt his supposed mineralogical knowledge. The comments on the Bathurst granitic rocks are, like the earlier comments on Hunter Valley coal, essentially second-hand.

[55] On the Quindiu Pass between Quito and Bogota. See a sketch in *Vues des Cordillères* by Humboldt & Bonpland (1810).

[56] The Springwood rocks are all of sedimentary origin. It is difficult to imagine what Stein thought he saw.

rising gently[57] *Since in this kind of country, in general, ore-bearing deposits occur and in gneisses mineral like tin, lead, copper, cobalt, and precious silver ore (the last one as the latest deposition) are present. They are found in vertical and horizontal dykes with galena, calcite, and pyrite.*

Since gneiss in nearly all countries contains silver and at Salzburg there are both gold and silver in it we can assume that all minerals like gold, silver, galena, copper, lead, iron, manganese, bismuth, nickel, arsenite and tungsten will be discovered in New South Wales, and the same quantity of them as in other countries, eg, Saxony and Bohemica should be obtained there. Shortness of time prevented me to carry out a proper investigation, and so I have discovered there only gold, silver, copper, lead and iron. Further exploration is required[58]

Mica schist, the third member of the schist unit[59] *exposed here and there consists of greenish grey and reddish brown mica with grey fine quartz with small amounts of precious garnet and with layers of chlorite schist and nephrite.*

Tops of mountains formed of them are covered by vegetation and thus only scattered boulders may be seen.

Primary clay slate, the fourth member of the schist system [of Werner] is tranversed with vertical veins, finely and coarsely schistose, slaty with yellowish grey, smoky or black colour. It contains [thin] hornstone and clay interlayers. The subordinate rocks forming layers in it – whetstone of Springwood and Bathurst; slab slate and roof-slate on the bank of Cox's River, nephrite (as in New Zealand); in chlorite schists are surrounded by clay slate.

Rounded lumps of quartz schist and fragments of other rocks more or less rounded could be found on the banks of the Hawkesbury River, which floods a wide area around at times. Mountains composed of clay schist are gently undulating and covered by vegetation. The cliffs of the bank of Grose River are neither high nor steep[60] *In quartz reefs there is gold, red copper ores, chrysocolla, malachite and grey copper ore*[61] *They pass into transitional clay slate and greywacke slate.*

Porphyry and syenite boulders and also purplish knobs could be found in many places. The conical-shaped Hat-Hill [62] *is composed of porphyry with flesh pink paste with weathered feldspars here and there, grey quartz and hornblende partly in weathered grains and partly in crystallized rods.*

In mica schist and gneiss there is splintery smoky grey hornstone porphyry. There is also brown red feldspar in clay porphyry in [the] Blue Mountains. Porphyry sheets are from 15 to 20 feet thick having a dip which does not correspond to the other rocks, and a slaty character.

The thick layered syenite is composed of leek-green hornblende, reddish feldspar with admixture of grey quartz and a small quantity of black mica. Syenite in granular detached lumps could be found at Prospect Hill and in many places in the Blue Mountains.

In rocky country, in the mountains of New South Wales, syenite often forms steep cliffs and rugged piles, caused by its heavy fissuring. There occurs greywacke, greywacke slate composed of quartz and clay, and quartz schist passing into clay slate with feldspar grains, mica and quartz interbeds cutting the rock in different directions. The grainsize varies from fine grained up to conglomerate, with ash grey and smoky grey quartz as [the] predominating mineral. These rocks are lying on the older primary schists and form isolated mountains with rough, steep hills (cliffs) and narrow river valleys.

Sandstone forms the far parts of the Blue Mountains, the same platy sandstone can also be found in the deep gullies of King's Tableland. It forms tremendous vertical and very steep walls, cones, pillars, and pyramids. A lot of mountain creeks here and there carved small caves and depressions in it, and cascade-like waterfalls have been formed.

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[57] The general regional dip is to the east at a low angle. Whether Stein confused the strong cross-bedding with true dip is uncertain.

[58] Stein's generalisations concerning mineral occurrences had no basis on what occurred in the Blue Mountains, but in drawing a long bow, in time it was certainly true that most of these minerals turned up somewhere in New South Wales (as it was then 'defined').

[59] See Werner's classification (Jameson 1808, p. 121).

[60] Stein only saw the mouth of the Grose where it met the Nepean to become the Hawkesbury River. A little west it flows in a quite restricted cliffed valley.

[61] This seems thrown in here with little or no relevance to the expedition.

[62] This probably refers to the prominent hill north of Blackheath. Stein certainly did not visit it, but might have glimpsed it in the distance.

According to the barometric measuring of G. Oxley[63] *King's Table Land lies 3000 (with correction 3325) feet above sea level. A spacious cave, hitherto unknown, I have named Lawson's Cave in honour of the Commandant Mr. Lawson*[64] *I have also bestowed names on a few summits and projecting points (headlands), e.g. Pansner's Cape*[65] *Wert's Hill*[66,67] *Severgin's Cliff*[68] *and the abrupt walls of a frightful abyss Werner's Precipice.*[69]

Basalt fills the depths of Botany Bay and occurs near the gullies of King's Tableland, where a great part of it has been wiped away by floods. Surface weathering and the action of rain water have produced the oddest shapes.[70] *I found augite crystals and magnetic sand. Olivine and other components affected by the atmosphere are decomposed and washed away. A remarkable feature of King's Tableland is the large number of springs. Basalt being a compact and cold stone, draws water vapour from the air and conducts it through vertical fissures down to the clay which checks its further downward movement. In gentle sloping valleys there are swamps formed where peat and bog ore occur. Some of the springs have chalybeate water and in many of them I noticed mineral oil*[71]

I have not found here any volcanic rocks which are common on many Australian and South [East] Indian islands. On New Holland, Norfolk, [?]Tanua, [?]Maliholo, Tahiti, [?]Anaurichon, Marquesas, New Zealand an[d] Van Diemen's islands there is basalt; therefore we can conclude that rocks of the trap formation may be also discovered on the other Australian islands. Since in the neighbourhood of sheet-trap some gemstones occur and [?]then [?even], let us say, that their origin is closely connected with parent rocks as e.g. on Ceylon island, where zircon, hyacinth, spinel, sapphire and garnet and other gemstones occur. On this basis we can assume that some or even many of these gemstones may be found in Australia despite the fact that they have not yet been brought to light. On Kao, Tofua (which erupted 1774), Amboine (probably Ambrim), Tanna [Tana] (which erupted 1773) and [?]Sasaiga and one of the Queen Charlotte islands there are volcanoes, and of course consequently a lot of volcanic products occur.

On Easter Island where subterranean fires and earthquakes have caused important changes, there are pozzolanes, [?]rotten stone, obsidian and lavas of different colours and density.

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[63] John Oxley (1785?–1828), surveyor-general.

[64] The site of this cave has not been located. A small overhang on Jameson Creek, about 600m upstream from the present Wentworth Falls, might possibly have been the site. However the note describing it, in Cunningham's Journal (see later) makes this possibility doubtful. Barratt 1988, p. 104 wrote that Stein and party had reached and discovered Jenolan Caves, a quite impossible task in the time available (see further comments below in 'Discussion' on this and related matters.

[65] Lorents (Laurentiy Ivanovich) Pansner, see Figure 2.

[66] Named for Franz Ivanovich Wert, see Figure 4.

[67] Anastasenko (pers. comm.) notes that Khvostov (1825) said that Wert Hill was 'composed of basalt', but, as indicated later in the present paper this is not correct.

[68] Vasilii Mikhailovich Severgin, see Figure 3.

[69] Abraham Gottlieb Werner, see Figure 5.

[70] The suggestion that Botany Bay (as now known) contained basalt had no basis, although it must be remembered that Stein, in the tradition of Werner, would have regarded basalt as a Neptunian rock. However it is possible that Stein was familiar with a publication by Karsten (1808, p. 83) in which Karsten said that there was basalt in the Trap Formation at 'Botany Bay'. He was almost certainly using this term as a general reference for the New Holland region. A basaltic rock only occurs in a small volcanic neck towards the southern end of King's Tableland (McElroy 1960), which Stein did not visit. The odd shapes on Kings Tableland were described by an earlier visitor, Major Henry Antill (1779–1852) in 1815: 'the whole of the tableland next to the chasm appeared as if it had undergone a violent volcanic eruption, the stone seemed to be in a state of fusion, forming all manner of shapes, and having the resemblance of melted sand and even ironstone, and the place altogether formed a wild and picturesque scene of nature' (see Mackaness, 1965; Vallance, 1975). Although Stein was not correct in talking about basalt here, he was correct in ascribing the curious shapes in the sandstone to weathering and water, rather than the more Wernerian interpretation made by the earlier visitor, Antill.

[71] The surface 'mineral oil' was almost certainly just a surface scum.

On Tanna Island sulphur, melanterite, copper pyrite and lava with leucite occur. Leucite was found by Forster on Tahiti Island. He believed that the black shore sands were composed of pumice and schorl. Lava also occurs in New Zealand and the Marquesas and Tahiti Islands. Pumice was also found by Forster on New Zealand; on banks of [?] Anauroka pumice [has been] thrown out by the sea. Gypsum and lumps of limestone occur on Tahiti, greenstone schist in New Caledonia, nephrite in New Zealand and Tahiti, where also chlorite schist with [?]assianthus and quartz veins occur.[72] [73]

The Blue Mountains, covered though they are from foot to summit by tall trees, must in Shtein's opinion be considered among the very oldest on earth ...[74] *Thus far, only a small portion of them is known, over an extent of 200–300 English miles. The Newcastle coal deposits are to be regarded as belonging to the same range. Those coal deposits consist of schists and clays and contain incalculable quantities of plant- and, especially, reed-imprints. According to Shtein, the Blue Mountains adjoin and are actually linked to the Asian ranges to the north, when viewed as part of the global system of ranges liked by islands lying between New Holland and Asia ...* [some material omitted]

No volcanic hills were observed anywhere. Shtein thinks, on the basis of comparisons between the mountains he saw and rock types and strata formations in other lands that yield precious stones, that New Holland, and the adjacent islands will also be producing such stones, and that these will in time be found.

[72] All these notes were essentially second-hand, perhaps mainly from J.R. or George Forster's publications, for which see Hoare (1976).

[73] Vasiliev's own summary (1823) of what was covered by Stein in the above reads: (1) The soils and strata of the earth, clays, sands, etc., seen over the country in question ... (2) The hills, elevations, and mountains of that country; (3) the various minerals observed, e.g. sandstones, slate, granite, feldspar, quartz, porphyry, syenite, ordinary and precious garnets, pyrites gold-bearing and otherwise, gypsum, gneiss, basalt etc. also found were traces of gold, silver, copper, iron ore, and lead.

[74] Stein's opinion, made before he had visited the region, had really no scientific backing. He might have retained this erroneous opinion based on the apparent absence of fossils, but seems to have been more influenced by the evidence of 'old rocks' among the gravel samples found in the Nepean River. The rocks of the Blue Mountains were accepted as relatively young by later visitors such as Strzelecki, and perhaps even younger by Charles Darwin.

Figure 2. Lorents (Laurentiy Ivanovich) Pansner (1777–1851). Pansner was the first Director of the St Petersburg (Imperial) Mineralogical Society. Between 1819 and 1822 he was head of the Department of Mineralogy at St Petersburg University and the first director of the famous mineralogical collection (1819–1822). He studied more than 200 minerals and had travelled widely, examining mining localities and preparing maps of many parts of Asia, joining the provincial trigonometrical survey at St Petersburg in 1809, before curating the mineral collection. Pansner had contact with the famous German romantic poet, writer and naturalist J.W. Goethe (1749–1832), (Hennig 1949). Earlier he made his name by compilation and publication of a French-German Mineralogical dictionary and taking part in an expedition to China, acting as mineralogist and 'historian'.

Figure 3. Vasilii Mikhailovich Severgin (1765–1826) is perhaps even better known than Pansner. He was an outstanding Russian mineralogist and chemist, who developed Russian mineralogy, economic minerals and petrography. He was one of the first Russian scientists to adopt the anti-phlogiston theory of Antoine Laurent Lavoisier (1743–1794), and his 'Assaying Art' published in 1801 was one of the first original works published in Russian based on this theory. Earlier, when a student at Göttingen University, he studied basalt outcrops nearby and became involved in the arguments between the 'Neptunists' and 'Plutonists', supporting the latter view. During his time as Professor of Mineralogy at the St Petersburg University he gave more attention to mineral chemistry rather than to crystallography (Kurochin, 1975; Leicester, 1959).

Figure 4. Franz Ivanovich Wert (1782–1856). Despite having no particular training in mineralogy, as a child he became interested in minerals and collected for the remainder of his life. He published on gems from the Urals, and on the colour of emeralds. He had particularly friendly relations with Pansner, and became Secretary of the St Petersburg (Imperial) Mineralogical Society, remaining in the post for 39 years.

Figure 5. Abraham Gottlieb Werner (1749–1817). The influential teacher of 'geology' at Freiberg, Germany. Unaware of Barrett's 1988 research on Karneev indicating that he definitely made a sketch, Anastasenko (pers. com.) wrote: 'The artist probably captured this astonishing moment of nature as one or more series of drawings'. See Table 1 for evidence of two relevant sketches.

THE PUZZLE CONCERNING CUNNINGHAM

As indicated in Stein's report the Russians were guided by William Lawson (1774–1850), a pastoralist, former army officer, (and one of the three explorers who made the first crossing by Europeans of the difficult Blue Mountains plateau west of Sydney in 1813). I have not seen any Lawson writings concerned with this Russian expedition.[75]

However, as mentioned earlier in the paper the botanist-explorer Allan Cunningham also travelled with the party. Although Stein made no mention of it in his report, when passing through Parramatta the Russians visited Cunningham, who had just returned from a long exploring and surveying journey to the north under Captain Phillip Parker King (1891–1856), as noted by McMinn (1970). Cunningham was delighted to show them something of his plant collections and no doubt talk also about geology and other scientific matters. It is not clear if the Russian visitors spoke much English, but they might have been proficient in French, and Stein was German, so they seem to have been able to communicate, at least basically, with the educated local people. Cunningham offered to join the party, saying it would be 'much pleasure ... to shew them that British subjects in a similar profession are not wholly wanting in the ordinary acts of courtesy and attention towards such distinguished strangers.'[76] Also Cunningham wished 'to repay in some measure, the great obligation I lye under to M. Langsdorff[77] and other Russian gentlemen at Rio de Janeiro for their great civilities and attention paid to me during my residence in Brazil', which took place between 1814 and 1816.

It is thanks to Cunningham that we have many more details of the expedition, for he joined the expedition and documented its activities in some detail in his own journal (Cunningham, 1820). However it is extraordinary that in Stein's report of the expedition Cunningham receives not a single mention! It seems likely that Stein hoped to make a good impression with his peers in Russia with his report, indicating how much he had learned by his own observations, rather than admitting that much of what he wrote was second-hand information. However the Russians apparently did thank Cunningham at the end of their expedition (see fn 9).

Although generally authorised to 'pass the Mountains' Cunningham still had to apply for a passport from the Governor to join the party. However he was so enthusiastic to accompany them that, rather than wait for authorisation for a 'Government' horse, he hired one, at his own cost, for the period of the tour.

Set out below are Cunningham's Journal entries for the 'Tour'.

[75] Barratt (1988, p.276, footnote 94) comments 'Lawson's own papers, now in the Mitchell Library (ML A1952, unpaged) contain only fleeting references to the Russians.

[76] Allan Cunningham Journal, 6 March 1820. Archives of New South Wales Microfilm 46.

[77] Georg Langsdorff had sailed with Krusenstern, was a friend of Bellingshausen and became Russian Consul at Rio in 1813. In the early 1820s he organised a 'scientific' expedition into the interior of Brazil.

THE EXPEDITION, FROM CUNNINGHAM'S JOURNAL

7 March (Tuesday)
This morning Lawson arrived at Parra[a 78] *and set out with the Russians intending to proceed as far as the Nepean River. ...* [insignificant material omitted] *At 7 pm having received a passport, proceeded onward to Prospect; where I arrived at 8 putting up at a Farm House with an intention to continue my journey at an early hour in the morning.*

8 March (Wednesday)
During the last night much Rain fell in short showers, but at 5 a.m it being fair I proceeded to the Nepean River, where I arrived at 9 o'clock and joined the party on the left or opposite Bank, who had just carried over their Luggage etc at the Ford. Passing thro' the extensive flat named Emu Plains[79] *Where large gangs of Prisoners are employed falling and burning off the Timber. We ascended the mountains, halting at Spring Wood for the Day. It is unfortunate the Season is now very unfavourable for a Botanical Excursion, no plants were observed in a flowering or fruiting condition, in the whole extent of 12 miles ride this Day, which in any other part of the year, presents a very considerable variety of plants for the most part described. A few seed of Podolobiscum[?] heterophyllum were gathered. The Naturalist (who is a disciple of the late celebrated Professor Werner) is more desirous to pay more attention to the Geology and Mineralogy of the Country, than to its Botany, the wet unpleasant bad season for bot[anical] spec[imen]s was therefore not so much a subject of disappointment. Every remarkable stone in the bed of the [Nepean] River, at the ford was examined by him, and the quality of every rill of water in our journey ascertained by its sediment.*

9 March (Thursday)
After making some examinations and experiments with chemical acids upon the waters supplying the station, which was found much impregnated with iron [?] ore, we proceeded on our Journey to the westward on the mountains and about 1 p.m. arrived at the King's Table land, when the steep perpendicular cliffs of the Regents Glen [Figure 6],[80] *so much delighted M. Karneyeff the Painter, that it was proposed, we should encamp on its verge at night so as to afford him an opportunity to make some sketches, particularly of a Cascade or Cataract, originally discovered by Lieut Lawson, having its rise in the mountains that falls upward of 200 feet into the glen. We accordingly struck out of the line of road, into the Brushwood, and having passed thro' some boggy Elevated Vallies, arrived at the Edge of the Glen where we prepared to encamp for the Day, intending to occupy the whole of tomorrow in the vicinity examining the Plants, the Mineralogy of the country in the [?] and also to visit the Cataract, of which the painter was very desirous to make a sketching. In the course of this Day's journey, the character of the Rocks their dip to the Horizon and direction were particularly attended to by Mons. Stein, and a few insects were collected.*

That fine Acacia (pugioniformis)[81] *afforded each of us some seeds, and a plant of the [?]habit of Persoonia [?]suspected a Pimelea bore ripe red fruit, of which specimens were gathered*[82]

Rain set in, in the Evening & rendered our situation by no means comfortable particularly to our Russian friends, neither of whom had taken the precaution to bring blankets with them being given to understand all the comforts would be provided them. However between Mr Lawson & myself they were supplied with these necessities, from our own luggage.

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[78] Last letter superscript in the original.

[79] Here Cunningham inserted a footnote concerning the intention of government to turn Emu Plains into a wheat-producing area to feed the convicts.

[80] As Cunningham indicated a number of times in his journal the travellers were at a locality he called the 'Glen'. This was short for the name first given by Governor Macquarie on his journey across the Blue Mountains in 1815 – 'Prince Regent's Glen' in honour of the English Prince (later King George IV). Today the name 'Prince Regent's Glen' (Figure 6) has been largely forgotten, except by historians. Stein probably did not have time to draw a map of the Glen, (which is about 30 km in circumference) and its cliffs, so we do not know exactly where the places he named are. However we know (Table 1) that Karneev named several of them in sketches he made.

[81] Now *A. quadrilateralis*.

[82] For Persoonia see Harris 1971, pp. 7, 130, 132 and plate 37. For Pimelea see Harris 1971, p. 111 and pl. 62.

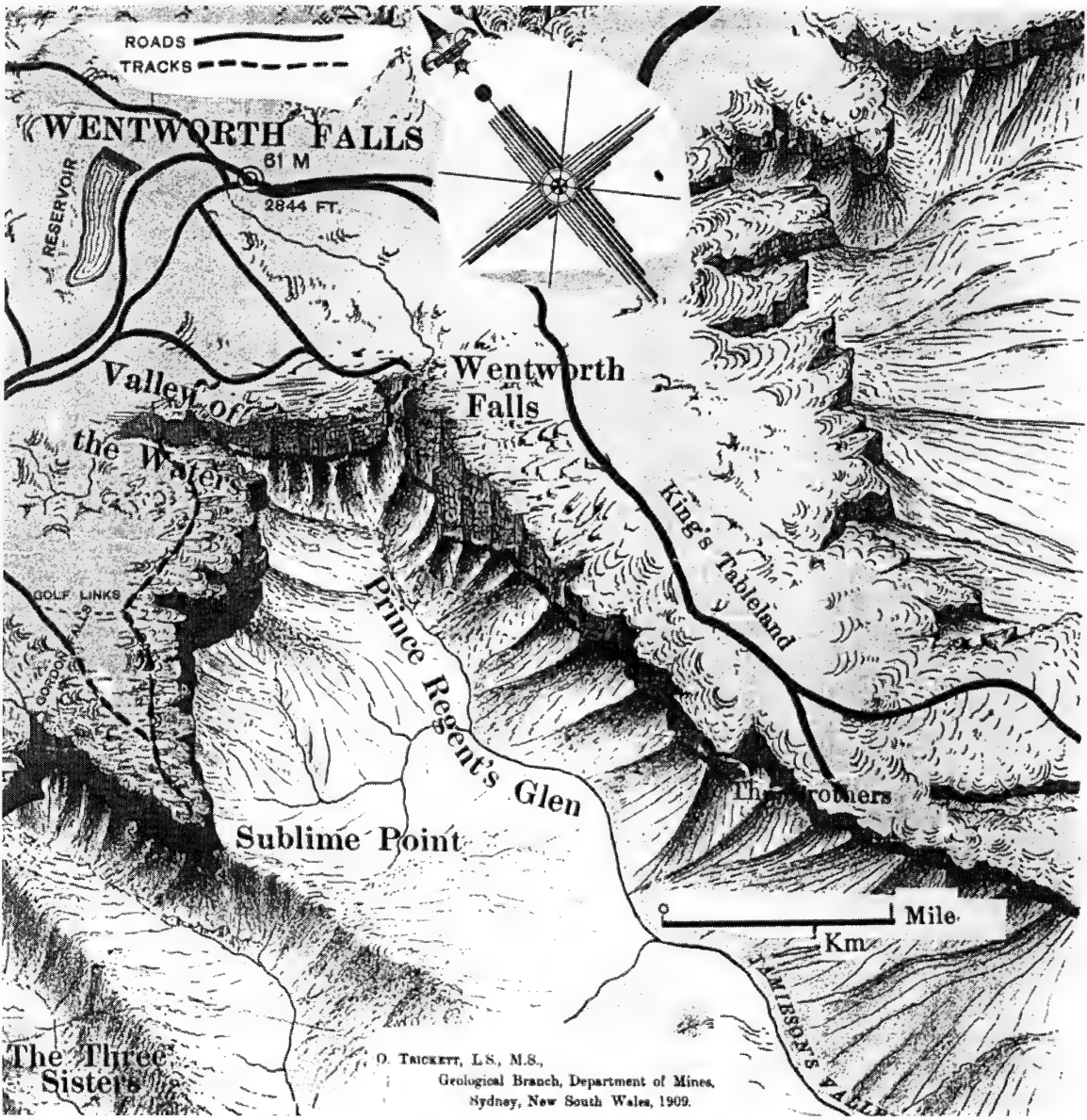

Figure 6. Detailed map of the Prince Region Glen.

10 March (Friday)
It was with difficulty we could keep our fire [?] in during the earlier period of the Morning, in consequence of the small drenching showers that fell, particularly about daybreak. Intended to spend the next day examining the location about the camp.

About 9 am the Rain cleared off, the weather continuing fair, we accompanied the Russians round the Edge of the Glen several miles, in hopes of finding a declivity tolerably practical, to allow us to descend to its base, so much desired by our mineralogist, where no doubt he would have made some discoveries in that Science, worthy the research, to compensate him for his indefatigability and zeal. However it was perpendicular on all sides, of an awful depth, in some places overhanging the base of the Cliffs, many feet, occasioned by large portions of the face of lower parts having fallen down, by the action of the weather, thereby rendering it in some measure dangerous to approach to the upper edge, lest our several weights might be sufficient to break off the overlapping brow, (then without support), & precipitate us with it into the dark abyss of the forest beneath.

In the bed of a small Rill of water, that descends over soils into the Glen, masses of Sand were discovered, in which a glittering scaly substance like mica, was found, which was pronounced Gold, and a singular cave was entered, which is supported by a column evidently the effect of [?fire] which Stein called Basaltes, in which a vein of ore said to be Copper was discovered. The appearance of the Cave, its high Arch'd roof, almost smother'd in Vegetation, view'd with the romantic [?]Wil ... [remainder of words of phrase obscured] *afforded ample materials for the pencil of Mons. Karneyeff – outsides of this cave I gathered pieces of a small Plant of asphodeleds, nearly relate to [?]Boya*[83] *& Laxmannia, bearing flowers & [?] and in ...* [here follow some lines detailing botanical finds in the area]

Pleuranclea sp. perhaps Empetrifolia, Goodenia decurrins sp with [?], Azorella elliptica, [? several plants and descriptive terms not deciphered] and a shrub suspected Lasiopetalum in an imperfect state.[84] *sp. perhaps Empetrifolia. – Goodenia [?]decurrins spm with[?]Le.*

Azorella elliptica, [?]u... compostis, folii ellipticus sparsis [?] Pleurandra[?]leabia ... and a shrub suspected Lasiopetalum in an imperfect state – also of Mirbelia gran ... [remainder of the text is not decipherable]

I gathered a few seeds, a fine Perpilionac plant with yellow flowers and at a paper of less of Phyllidium setacessia and a stunted sp. of Callitris bearing ripe fruit frequent in acid sandy sitns.

In the afternoon went round the NW side of the glen to the Cascade which was named when discovered Campbell Cataract as a compliment to Mrs Macquarie.[85] *This waterfall is formed of several streamlets in the mountains, particularly by their union with a rill of water running thro' Jameson's Valley at the 20 mile mark, and by this junction a stream 20 feet wide is formed on the edge of the Glen, which having dropped over some natural steps, falls an estimated descent of 280 feet [88 m] upon a shelving rock and then to the base of the glen, running easterly 'till at length it unites itself with the Nattai and Warragamba, which rivers empty themselves into the Nepean*[86] *The perpetually [?rising] mist,[?] sent a barcaill,*[87] *naturally gives a particular character to the Botany of this Extreme of the Glen, no plant loving a dry barren [?] can exist within the influence of these humid vapours, where Ferns (for the most part of [?]Common [?] are very abundant, with the following plants ... [some lines of named plants]. Our Painter having finish'd some extensive sketches of the body of water, we join'd him & return'd at dusk to our encampment. Cloudy night.*

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[83] Boya not identified, possibly an incorrect reading of the handwriting. Asphodel a herb of the Asphodelaceae Family (Carolin & Tindale, 1993, p. 628).

[84] The various botanical names and descriptions in this difficult to read sentence need a knowledgeable botanist to decipher the text. Debenham 1945, vol. 2, pp. 348–349 lists some 75 plants identified in Russia after being taken there by the Bellingshausen Antarctic expedition's two visits to Sydney. Only one plant is coincident with those identified by Cunningham. Barratt 1988, pp. 130–131 says that Stein's plants were placed in the Academic of Sciences botanical garden in St Petersburg in August 1822. The collection must have been regarded as more important than the 'mineralogical' specimens.

[85] These falls had a series of names. *Campbell's Cataract* was named by Macquarie on his 1814 visit for his secretary, John Thomas Campbell (c. 1770–1830), brother of his second wife Elizabeth. However many people called them the *Falls of the Weatherboard*, referring to an early building and a later inn, at the western road, upstream on Jamison Creek. The astronomer and scientifically-minded next Governor, Sir Thomas Brisbane (1773–1860), changed the name to *Bougainville Falls* in 1825 to honour the leader of the French Expedition, Hyacinthe Y.P.P. de Bougainville (1781–1846) then visiting New South Wales. The falls, like the town, finally came to be called *Wentworth Falls*. The original Weatherboard Hut was replaced by a more substantial building, the Weatherboard Inn, built between 1826 and 1829. This became famous later, when people remembered that Charles Darwin (1809–1882) had stayed there during his expedition across the mountains in 1836 (Nicholas & Nicholas 1986).

[86] Some of this information Cunningham had probably learnt from his friend Sir John Jamison (1776–1844), a member of the Wernerian Natural History Society of Edinburgh, who led the first journey by Europeans up the Warragamba River in November 1818 (Branagan 1985).

[87] Not deciphered.

11 March (Saturday)
The unsettled state of the weather the limited leave of absence from their ship and the desire of the Painter to see all the towns (and cultivated lands) in the Colony obliged our Russian Friends to give up all idea of proceeding further to the west'd. being now only 25 miles on the mountains is about halfway to Mt York, their western Descent.

Accordingly about 9 a.m we left our camp on the verge of the glen and proceeded back to Springwood, at which Depot we arrived about 2 p.m. Upon passing 'Caley's repulse', the occasion of the erection of the Pile of stones, that still meet the travellers Eye near the 17 mile stone, was fully explained to mons. Stein, who received the s[?] current story from me, as a pleasant item of Information acquired in the Tour worthy to be recorded to the credit of that indefatigable unwearied Botanist whose name, this [?] transparent pile of stone perpetuates![88] *Clouded sky but fair weather.*

12 March (Sunday)
Morning extremely fine with every appearance of settled Weather, We did not leave the Depot until 10 a.m. owing to some delays, that had been occasion'd in securing our beasts who had stray'd to some distance on the road to the [Nepean] River. However the time was fully occupied by our Russian Friends; the painter gave us a fine sketch of the Depot in the midst of the large tall Forest trees, which form the leading feature of the Picture, originally giving rise to the name this stage has rec'd [?] Hut. [The] walk I took with Mons. Stein to the water gully, supplying the Depot; the quality of which he wish'd again to examine, we detected some very fine plants – of Chloanthus glandulosa of Mr. Brown, bearing flowers and some ripe fruits, growing in large tufts with Tristania laurina[89] *and Lomatia silaifolia, among other common plants of the Colony, forming however a pleasing diversity and then were conducted by Lawson to Castlereagh House (about 2 miles distant from the River), the residence of Rev R. Fulton*[90] *the Clergyman & Magistrate of the small district of that name, where it was proposed we should stop for the Day, & where we were received with the utmost friendship and hospitality, by the excellent & [?] host. Heavy rain set in the Evening continuing without intermission til daybreak.*

13 March (Monday)
Heavy rain continued during the Forenoon, preventing us from stirring out of doors till about one p.m. when the Rain eased, and the weather partially cleared up. The Painter made some sketches of the Parsonage house, whilst Stein returned to the stony ford of the River, to examine further the large pebbles that have been brought from the Western Country, thro' the Warragumba by the force of Floods.

The District of Castlereagh is of small extent, consisting chiefly of rich lands, subject in part to inundat'n partly located to small settlers. – Near the Parsonage, has been erected a small brick Church, around which are the rudiments of a Town, mud & wattled residences of poor settlers. In some low swampy land, I observed a beautiful Lythrum, decorating a considerable extent with its beautiful flowers. gather'd seeds of it, with those of E[?] variet/var. Br. – Showery throughout the Evening.

14 March (Tuesday)
We availed ourselves of the apparent fair [?]aspect of the Weather, & left Castlereagh at an early hour intending to proceed through the Cultivated Lands to Windsor by the way of Richmond, but had not proceeded on our journey 4 miles when we were overtaken by some small showers ... on our arrival at Richmond the rapidity of the Hawkesbury River in consequence of the Rains, render'd it rather hazardous to attempt to swim our horses over at the Ferry obliged us to continue our journey to Windsor, rather than halt for the Day at the House of a respectable Settler at Rich'd Hill, situate on the opposite side of the River. Passing thro' a rich agricultural tract of Country [?] occupied evidently by industrious Settlers, we at length reached Windsor where we put in at the Hotel for the Day, rain having already set in with much wind from the South.

[88] The exclamation mark at the end of Cunningham's note suggests that he knew the cairn had not been built by Caley. However in 1817 Cunningham had written that it had been erected by Caley. Caley was almost certainly never in this part of the Blue Mountains (Webb 1995, pp. 73 74). Stein made no mention of the cairn in his report of the tour.

[89] For the shrub Chloanthus see Carolin & Tindale, 1993, p. 598. The tree or shrub Tristania is now *Tristaniopsis laurina* (Carolin & Tindale, 1993, p. 369), the 'Water Gum'.

[90] Henry Fulton (1761–1840). For Fulton's interesting life see Cable (1966).

In the Afternoon I accomp'd the Russian Gentln to the opposite Bank of the River with the Ferryboat for the purpose of taking some sketches of the Town from Different positions. On these rich flats, which are covered by the water sev'l feet during the great floods, I observed – among other plants, abundance of the Arum or [?] With the plant call'd Native Elder, bearing flowers, which are [?] a species of Cal[?] [?][91] *The Return of rain obliged us to make a quick return to the Hotel, affording Mons. Karneyeff barely time to complete the outlines of the Views he had partially taken. Distant thunder from the Mountains – bearing to the North'd of the Town.*

15 March (Wednesday)
The Rain that had fallen during the night ceased at dawn of Day, & the morning was ushered in, with a tolerable fair aspect. Having discharged our Bills at the Hotel we quitted Windsor, taking the high Richmond Road, to Prospect Hill, the Estate of Lieut. Lawson a distance of 16 Miles. The late and present wet weather had wash'd up the Roads which to a Degree as to make them almost impassable in some parts, – the consequence was, we did not reach Prospect Hill till 2 p.m. all being completely drenched with the showers of the Day. A short cessation succeeded by fine weather, in the Aftn gave Mons. Stein an opportunity of examng the large blocks of stone in the highest parts of the Hill, which proved to be a black speckled granite,[92] *and he also examined the spring of saline mineral water on other Gentlemen's Estate, requesting he might receive 3 or 4 bottles of the water before he left the colony.*

In the evening I conducted my Russian friends back safely to Parramatta, where they put up at the Inn and I returned to my House. Cloudy but fair night.

16 March (Thursday)
Clear Fine Morning. Messrs. Stein & Karnyeff having made up their minds to stay at Parramatta during the Day, with a view chiefly to allow the latter Gent. to add some sketches further to the Collection he had made in this short Tour, I shew'd them round the Town and its vicinity and about one o'clock, upon the arrival of Mr. Lawson l, we all waited upon the Governor, & obtain'd a short interview with His Excellency, who thank'd both Mr. Lawson and myself for the attention we had shewn the Distinguished Strangers, regretting however, the weather throughout had been so unfavourable for our researching. I having offered to conduct these gentlemen to their Ship tomorrow, Mr. Lawson return'd to his farm, [?] urgent avocat'n calling him away to another part of the Colony. Cloudy with showers at Intervals.

17 March (Friday)
Having sent off the Cart containing the Luggage of the Russian Gentm, we left Parramatta abt 9 o'clock for Sydney where we arrived about noon, and agreeable to an invitation from Sir John Jameison, I met the whole of the Russian officers at dinner in the Evening, where His Excy the Governor, the Lieut Governor and most of the Naval military & C'nl officers of the Colony were present showery during the Day. –

18 March (Saturday)
Fine clear Morning – I went on board the ship Blagonamerenny, & was met by Mons. Stein, who very politely shew'd me his library of valuable works furnish'd him by the emperor. Among them I was gratified with a sight of Humboldt's most magnificent works on the Botany of so. America, with his splendid Monograph of the [?] Milastomea, wherein I saw sevl. specs. seen in Brazil. – I also noticed the works of Labillardiere[93] *etc. –*

Early in the aftn. I return'd to Parr'a. and discharged my horse hire & other expenses attending the late Tour. – Evening Cloudy.

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[91] *Sambucus australasica.*

[92] It is a variety of dolerite, but, as mentioned earlier (see fn 29), could have been regarded by Stein a variety of syenite in Werner's classification.

[93] J.J.H. de Labillardiere (1755–1834), the French botanist of the D'entrecasteaux Expedition, 1791–93.

DISCUSSION

Stein's report tells us something of the nature of the geology around Sydney, concentrating especially on the nature of the local sandstone 'which seems to constitute the main rock of the coastal area of New Holland'. Stein also recognised the shaly rocks ('sandstone-slate' and 'transitional clay-slate') in the vicinity of Parramatta overlying the sandstone, which are now recognised as Triassic shales. He also recognised the high dips of the rocks on the eastern edge of the Blue Mountains (Lapstone). These matters accord generally with the presently accepted facts.

Unfortunately Stein then got rather 'carried away' by some of his theoretical ideas, and they seem to have coloured the interpretation of his observations as he travelled west. For instance he observed some iron-rich varieties of sandstone and interpreted them as syenite or porphyry, and some darker rocks as basaltic, although admittedly basalts do occur in a few localities on the Blue Mountains, but not where the 'expedition' travelled.

Equally Barratt (1988, p. 104) moved out of historical reality to push strongly that the Russian 'cave discovery' indicated that they travelled to Jenolan Caves. While Barratt (1988) did excellent research uncovering Karneev's career and his art, he was apparently not familiar with the Sydney region to any extent, and rather underestimated the landscape of the Blue Mountains and its surrounds. Despite making reference to Stein's 1830 publication he may not have translated it in full, and has relied apparently on the summary made by Vasiliev of Stein's achievements, together with some material from Cunningham's journal, but without examining Cunningham's report in detail. Thus, almost in the style of Stein, he made some extraordinary conjectures about the expedition. It is appropriate to repeat the following, given *in extenso* from Barratt (1988, pp. 104–105):

> *... Cunningham, aware that his guests had little time to spare ... descended the scarp of the plateau beside Mount York. Plainly, the party had traversed eucalypt forests with some undergrowth along the westward-trending ridge, crossed the plateau and Cox's River, and at least caught sight of the extensive Western Districts of today. It is impossible to specify their route exactly. The portfolios left by Korneev and the Stein report suggest a brief stop on the south edge of the area of the Jenolan Caves ('Shtein discovered a vast cave near the King's Table Land, hitherto unsuspected, and named it Lawson Cave after the commandant'), and another pause along the Campbell River. Among Korneev's sketches – lost today, regrettably – was one headed 'Campbell Tableland in the Blue Mountains of New Holland.' However that may be, it is apparent that the Russians found a limestone cave of huge proportions to the west of Mount Victoria, detected gold in one or more mountain creeks, collected insects large and small, and botanised.*

It is clear from Cunningham's journal that the party never went beyond Wentworth Falls, so Barratt's interpretation of the journey continuing west is nonsense.[94] In particular to reach the Jenolan area in the time available would have been quite impossible, even if a route had been known. In addition, with Stein's acclaimed mineralogical skills, had the party encountered limestone he would surely have identified it, and it is one rock type notably absent from his list. Although Barratt calls the discovery 'a vast cave' Stein calls it merely spacious, while Cunningham says it is 'singular'. There is no doubt that the 'cave' was merely a large hollowed out section of the sandstone, similar, but larger, to the caves described by Stein in the coastal cliffs near Sydney.

[94] All this is surprising in that Barratt (1981, p. 159–160) seems to accept the correct facts, that the party merely went to Kings Tableland and then back. What caused his later ideas is not at all clear.

CONCLUSIONS

This paper makes available an additional early report by a foreign 'scientist' to those well-known from other such 'Continental' visitors as Labillardiere, Depuch and Bailly, Peron and Quoy, and predates visits and observations by such as Lesson, Menge, Lhotsky, Leichhardt and Strzelecki. It also contains the journal notes compiled by Cunningham, not previously published. This report is important to the present study in that it clarifies the route of the journey made by the Russians and shows conclusively that some assumptions made by Barratt about their travel and discovery must be discounted. While the names of foreign men of 'science', such as Cuvier and Lamarck, given to coastal sites in the early 1800s, still remain (Vallance 1975, 1983), it is a pity that Stein's four 'scientists' names never appeared on a printed map and had a chance to be perpetuated. They would thus have been forerunners of the many such scientific men (mostly English), whose names became scattered on the maps of Australia from the 1830s, thanks to explorers such as T.L. Mitchell, G. Grey and others (Branagan 2009a).

Thus the names of the three famous Russian Mineralogists with their also famous German contemporary Abraham Werner must be regarded as 'lost' in the Blue Mountains. Historians of Geology when visiting the locality at least give them a passing thought (Vallance & Branagan, 1976, Branagan 1994, 2009b).

It is pity, too, that the sketches by the artist Karneev have not been unearthed and might not have survived. It is likely that Karneev's depictions of what we now call Wentworth Falls were the first by any artist, preceding those by Touanne (1824), Augustus Earle (c. 1827), Conrad Martens and many others (for which see Speirs 1981).

The lack of mention by Stein of Cunningham's presence on the 'Tour' seems quite inexplicable. Cunningham's Journal makes no disparaging remarks about the Russians, although it is likely that Cunningham's knowledge of geological matters, slight though it might have been, could have made him somewhat sceptical of many of Stein's pronouncements.[95] Despite Cunningham's early comments about the poor time for botanical collecting, and evidence that Stein doesn't seem to have shown much enthusiasm for the topic, as we have seen Cunningham recorded in his journal quite a few interesting plants at various times through the expedition, and Stein did take some botanical material back to Russia.

Stein's report tells us something of the nature of the geology around Sydney, concentrating especially on the nature of the local sandstone 'which seems to constitute the main rock of the coastal area of New Holland'. Stein also recognised the shaly rocks ('sandstone-slate' and 'transitional clay-slate') in the vicinity of Parramatta overlying the sandstone, which are now recognised as Triassic shales. He also recognised the high dips of the rocks on the eastern edge of the Blue Mountains (Lapstone).

The recent internet article by Kroupnick (2009) gives some useful information on the visit by *Blagonamerenny* and *Otkrytie* to Sydney based on sources such as Barratt (1998). It also discusses the tour by Shtein and Korneev (sic). However Kroupnick and Barratt uncritically overstate the value of Stein's report, which he says dealt with geomorphology, the chemistry of suficial (sic) waters, geology and mineral resources. He continues 'It is hard to describe and over-rate the whole significance of the pioneering activity of Shtein who picked up a considerable collection of rock, flora and insect specimen (sic).' However little seems to have been done with this collection in Russia, as with the 'fossil' bones taken from the harbour. More importantly I must take issue with this author's statement that Shtein 'compiled the first quite realistic scheme of the geological development of the blue mountains terrain.' In view of the inaccuracy of Stein's comments it is probably a good thing that 'the fact of Shtein's discovery of the occurrence of hard rock and alluvial gold in the Blue Mountain's region remains virtually unknown.'

[95] Although there was no geologist with the various P.P. King coastal explorations with which Cunningham sailed, prior to the 'Tour', King and several other officers had some knowledge of geology, and many rock specimens were collected (Branagan & Moore 2008). Although not mentioned by Stein Lieutenant A.P. Lázarev, who had already met P.P. King, was pleased also to meet Cunningham who was already gaining a high reputation for his scientific work (Lázarev, 1950).

Aurousseau (1972, p. 5) sums it all up neatly '[Stein] made much theory (in particular about tectonics, lithology, ore deposits and gemstones) out of little fact.'

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David F. Branagan
School of Geosciences, University of Sydney
dbranaga@mail.usyd.edu.au

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Science for Gentlemen – The Royal Society of New South Wales in the Nineteenth Century

PETER J. TYLER

Abstract: During the nineteenth century the Royal Society of New South Wales and its three antecedents functioned as an exclusive club for men 'of honourable reputations' interested in the natural sciences. Almost without exception the members were pastoralists, merchants, or professionals such as clergymen, lawyers or medical practitioners. They classed themselves as gentlemen, because they were not engaged in physical labour. Only a handful were what we would now call scientists, because separate disciplines were only beginning to emerge, and career opportunities were few. Members of the Royal Society were part of the colonial conservative establishment. Women were excluded, while rigorous admission procedures ensured that 'working men' did not become members. Nevertheless, the Royal Society recognised the need to educate or inform the broader public about the achievements of science, and organised regular gatherings for that purpose.

Keywords: Batavia, Clarke, conversazione, Denison, gentleman, Governor Brisbane, history, Liversidge, Philosophical Society, Royal Society.

INTRODUCTION

This paper does not deal with the scientific achievements of members of the Royal Society of New South Wales during the nineteenth century, but instead will examine the backgrounds of the people who became members of the Society and its predecessors, and consider what they may have hoped to gain from their involvement. In a body with close to 500 members at its peak, there will inevitably be some broad generalisations, from which there will always be notable exceptions. Nevertheless, I hope to provide something of the flavour of this Society more than one hundred years ago, and that this will allow members to draw comparisons with the Society as we know it today.

BACKGROUND

The Royal Society name first enters Australia's history when James Cook and Joseph Banks sailed along the eastern coast of the continent in 1770. That was the Royal Society of London, which sponsored a scientific expedition to Tahiti to observe the transit of the planet Venus across the face of the sun. Afterwards, Lieutenant Cook opened his secret instructions from the Admiralty that directed him to search for a possible southern continent – *Terra Australis Incognita*. And so the barque HMS *Endeavour* sailed on through the South Pacific ocean, circumnavigating New Zealand before reaching that section of New Holland that Cook christened New South Wales. They then sailed home *via* the Dutch East Indies, to a heroes' welcome. Sir Joseph Banks, the wealthy young amateur botanist, went on to become the longest serving President of the Royal Society, holding that office for some forty-two years until his death in 1820. James Cook was promoted to Captain, and he too was elected as a Fellow of the Royal Society

Their epic journey brought European concepts of science to this continent. Astronomer Charles Green commenced observations the day after the ship anchored in Botany Bay. Joseph Banks and Daniel Solander diligently collected plant specimens at every opportunity, while their artists made painstaking illustrations of the flora, fauna and landscape. The late eighteenth century was the culmination of the Age of Reason, that period of enlightenment when educated men challenged traditional knowledge handed down from antiquity and the miracles of the Bible, and began to make their own empirical investigations of the world around them. The same intellectual movement led to political revolution in both America and France, but for the British it marked the beginnings of the Industrial Revolution that fuelled their imperial ambitions throughout the nineteenth century.

After the American colonies declared their independence in 1776, Britain needed a new location for its surplus criminals. Being the premier intellectual gathering in the country, the Royal Society was asked for advice, and its President, Sir Joseph Banks immediately suggested a place named in honour of his achievements – Botany Bay. Not only was this far distant from England, but it had the added attraction of gaining a foothold in a part of the world where Dutch, French and Spanish interests were beginning to form their own empires. And so it came about that a penal settlement was established at Sydney Cove in 1788, the year before the French Revolution.

To illustrate how timely this event was, at exactly the same time the Dutch were establishing the first scientific society in the region (perhaps in the Southern Hemisphere) at Batavia – modern day Jakarta – when the Batavian Society of Arts and Sciences (*Bataviaasch Genootschap der Konsten en Wetenschappen*) was formed. After some interruptions, this eventually became the Royal Batavian Society of Arts and Sciences (*Koninklijk Bataviaasch Genootschap der Konsten en Wetenschappen*).[1]

The early years at Sydney were difficult while people adjusted to their unfamiliar environment. Historian Alan Atkinson has remarked that 'for many years in this remote corner of the globe the eighteenth century stood still.' (Atkinson 1997). Nevertheless, settlers and colonial officials found time to collect and classify the animal, vegetable and mineral ingredients of this strange land. Partly this was to satisfy their curiosity, but also to explore the possibilities for commercial exploitation. Even some of the convicts found a profitable sideline collecting shells, birds, plants, and aboriginal artefacts for sale to visiting ships' captains, who in turn sold them for high prices to wealthy collectors in Britain and the Continent.

Scientific activity in the colony began as an individual activity, starting with the observatory set up by Marine Lieutenant William Dawes on the western side of Sydney Cove within a fortnight of settlement there. This was a short-lived venture, because Dawes was engaged primarily as a surveyor, and his services were required to lay out the town. Surveyors and other explorers were directed to collect specimens and report on the land they traversed, but this was not a structured activity. The first recognisable scientific institution was the embryonic Botanic Gardens created in the Governor's Domain in 1816. Charles Frazer was appointed superintendent and became Government Botanist in 1821, but being a gardener of lowly birth, could never join the Philosophical Society that formed that year, even if he could afford to do so on his modest salary of five shillings a day.

THE PHILOSOPHICAL SOCIETY OF AUSTRALASIA

Thirty years after the foundation of the colony, some stability, even prosperity had been attained, which meant that a few people had more time to indulge their interests in natural history. In 1821, towards the end of Lachlan Macquarie's term as Governor, ten men formed the grandly named Philosophical Society of Australasia 'with a view to inquiring into the various branches of physical science of this vast continent and its adjacent regions; and the mineralogical and geological state of these countries form primary objects of the Society'. To some extent, that emphasis has persisted to the present day.

The group met once a week at members' homes in rotation to discuss their discoveries, and to exchange books from their personal libraries. The Society asserted its exclusive status and serious purpose by penalising members the substantial sum of £10 ($20) if they failed to present a scientific paper on the allotted date, and they were fined five shillings (50 cents) if they arrived more than 15 minutes late for a meeting. They also contributed £5 ($10) each towards the cost of establishing a small museum at the Colonial Secretary's office.

Who were these founding fathers who met at Judge Barron Field's city house on 27th June 1821, and the others who joined later? (Table 1)

[1] Information from Dr Hans Pols, Unit for History and Philosophy of Science, University of Sydney.

Date Joined	Name	Occupation	Residence
27/6/1821	Dr James Bowman	Medical practitioner	Glebe
	Dr Henry Douglass	Medical practitioner	Parramatta
	Judge Barron Field	Supreme Court judge	Cabramatta
	Major Frederick Goulburn	Colonial Secretary	City
	Captain Francis Irvine	Army officer; farmer	Minto
	Edward Wollstonecraft	Merchant	Crows Nest
4/7/1821	Lieutenant John Oxley	Surveyor, explorer	Camden
14/11/1821	Dr Patrick Hill	Medical practitioner	Parramatta
21/11/1821	William Howe	Farmer & magistrate	Campbelltown
12/12/1821	Alexander Berry	Surgeon; landowner	Shoalhaven
2/1/1822	Sir Thomas Brisbane	Governor; astronomer	Parramatta
7/2/1822	Dr Donald Macleod	Medical practitioner	Parramatta
	Christian Rümker	Astronomer	Picton
1/5/1822	Capt. Phillip Parker King RN	Hydrographer; pastoralist	Penrith

Table 1: Philosophical Society of Australasia.

The Senior Chaplain, Rev. Samuel Marsden was invited to join, but declined because of a long-running dispute with Dr Douglass, who became secretary of the society. Dr Robert Townson, a gentleman scholar who had achieved scientific distinction in Europe, was also invited but being preoccupied with making his fortune on his property *Varro Ville* at Minto, does not appear to have replied (Goodin 1967).

When Governor Brisbane took office, he became President of the Society. The other members were relatively young men, with Brisbane the oldest, aged 48. Only one (Captain King) had been born in the colony, but even he was educated in England. Six were English, five were Scots, with one born in Ireland and one in Germany. Five had been medical practitioners; four had been army or naval officers. Six of them were members of the appointed Legislative Council. The medical men were notable in other ways: Bowman was Inspector of Hospitals, Douglass was Superintendent of the Female Factory, Hill became President of the Medical Board, while Macleod was the Governor's personal family physician. Alexander Berry had trained as a surgeon but soon abandoned this for more profitable ventures as shipowner, merchant, and major landholder.

Most of these men received land grants on the Cumberland Plain – typically 2,000 acres, and they were assigned convicts to work their farming or pastoral properties, usually at the rate of one convict for each 100 acres. They became instant landed gentlemen; they saw themselves as the future 'bunyip aristocracy.'[2] Their wealth was derived from the goodwill of successive Governors. Clearly they were all part of the colonial establishment, and they were conscious of their social position.

Governor Brisbane had brought two astronomy assistants with him to staff his private observatory at Parramatta. Christian Rümker was educated in Germany and had served in the Royal Navy. He was invited to join the Philosophical Society, and attended meetings when they met at Government House. Clearly he was socially acceptable, because on occasions he played the piano at musical evenings after dining with the Brisbane family (Liston 2009). James Dunlop, on the other hand, was of humble birth and little education, but was a skilled instrument maker. He was personable

[2] 'Bunyip aristocracy' was the term used by writer and politician Daniel Deniehy to ridicule W.C. Wentworth's proposal for a hereditary peerage to be included in the NSW Constitution.

and gregarious, but he was not a gentleman, and was not invited to join the Society or to Government House.

WHAT IS A GENTLEMAN?

Perhaps I should say something about the term 'gentleman' in this context. From the Middle Ages the royal courts of Europe gradually developed a code of conduct based on chivalrous, refined behaviour, with a strong sense of a family's honour and reputation. When Queen Victoria came to the throne in 1837 her long reign became synonymous with an era of preoccupation with respectability, morality, and nice gradations of social position. It was a period in England where class consciousness reached its peak. Because many of the settlers in New South Wales came from England they naturally sought to preserve, or at least to adopt these behaviours. Colonial-born residents with social aspirations happily absorbed these practices, because they were desperate to distance themselves from any suggestion of the convict birthstain (Smith 2009).

In England, a gentleman was considered to be a man with private means, preferably with an income from landed estates, who did not have to earn a living. He could normally be expected to have attended one of the exclusive public schools and possibly to have studied the classics at Oxford or Cambridge before embarking on the Grand Tour of Europe for a couple of years before returning to England to select a suitable wife from the debutantes on offer during the London 'Season'. If he had any profession this would likely be law, although he would usually go into politics rather than practice at the Bar. An elder son would inherit the family estates, but if he was a younger son, he might go into the Church or the Army to give himself a respectable occupation.

In the colony of New South Wales, sights had to be set a little lower because there was little inherited wealth. Here the distinction was based on whether or not a person earned his living from physical labour. Gentlemen included educated professionals such as clergymen, lawyers or medical practitioners, or they could be pastoralists owning large properties and even prosperous city merchants, as well as retired army and naval officers. In the early years many of these people were appointed honorary magistrates, while later in the century a large number became Members of Parliament, at a time when politicians were not paid and a substantial income from other sources was necessary to support their usually large families.

Many had migrated to NSW in the hope of improving their status and perhaps making a fortune, particularly after the conclusion on the Napoleonic wars in 1815, when former officers were placed on half pay, and there was widespread unemployment and crime amongst former soldiers and sailors. In England their family circumstances would never have entitled them to the rank of gentleman. None of the Philosophical Society members were emancipists or had convict parents, even though some of the most successful business men in the colony had convict origins. Captain Phillip Parker King had two brothers who had a convict mother, but his own background was impeccable, because his father had married a respectable English woman before he was born.[3]

Following the English model, class distinctions were scrupulously observed in nineteenth-century Australian society. One can see this in the forms of address used in the surviving correspondence and records of the Royal Society:

A labourer would be referred to as 'a man named Jones'.

A tradesman might be given a first name – 'Alfred Jones'.

A clerk in the civil service or a bank could be 'Mr A. Jones'.

But a gentleman would be 'A. Jones, Esquire' or 'Dr A. Jones, Esquire', if not 'Sir Alfred Jones'

If these terms were incorrectly applied, they could be regarded as a serious insult. Thus when John Macarthur addressed a letter to Magistrate Richard Atkins as 'Mr Richard Atkins' rather than 'Richard Atkins, Esquire', Governor Hunter had to intervene when a duel seemed imminent (Tink 2009). And of course,

[3] His father, Philip Gidley King was the third Governor of New South Wales, and had two sons with his convict housekeeper while Lieutenant-Governor of Norfolk Island.

our older members will recall that the use of 'Esquire' as an honorific persisted into the second half of the twentieth century.

In New South Wales, as in Britain, the Enlightenment ideals of reason and order were used to justify a class-based social system. 'The pursuit of such Enlightenment goals as the advancement of the natural sciences could ... act as a badge of social position. Interest in such cultural pursuits ... acted as an entrée to genteel society ...' (Gascoigne 2002).

Within the colony there were critics of the development of distinctive social classes. D.L. Welch, in the short-lived monthly journal *The Australian Era* wrote in 1850 about an 'aristocratic class' composed of merchants, retired officers, the clergy and professional men whose birth, education and occupation 'did not entitle them to this distinction.' Nevertheless, he complained that in the early years 'admission into this charmed circle, by any intrinsic merit, was nearly impossible.' He believed that these people should open the 'institutions for the encouragement of art and literature and science' to the wider population, for the good of the country (Welch 1850). No wonder his magazine did not survive beyond nine issues, if his prospective readers had to read that sort of revolutionary propaganda!

Outsiders did not always share the opinion that the colonial élite had of themselves. Charles Darwin was the archetypical English gentleman: upper middle class, well educated, interested in the natural sciences and independently wealthy. After spending some time in Sydney in 1836, including a pleasant evening at *Dunheved* with his old friend Captain Phillip Parker King, Darwin wrote (Darwin 2006):

'*Among those who, from their station in life, ought to be the best, many live in such open profligacy that respectable people cannot associate with them ... The whole population, poor and rich, are bent on acquiring wealth: amongst the higher orders, wool and sheep grazing form the constant subject of conversation.*'

Only a handful of these gentlemen were what we would now call scientists, because separate disciplines were only beginning to emerge, and career opportunities were few. In any case, the word 'scientist' was not coined until 1833 (Hooker 2004).[4] 'natural philosopher' was the common appellation until then. This does not mean that science was only a hobby, or a part-time diversion. Indeed, for much of the nineteenth century the gentleman amateur who conducted his research for love of the subject rather than for money was regarded more highly than somebody who merely engaged in science for a living, and his conclusions were considered to be more reliable.

OTHER CULTURAL SOCIETIES

This is not the place to recount how the original Philosophical Society collapsed in a little over a year because political factions formed. Eleven of the remaining members joined the Agricultural Society of New South Wales, formed in July 1822 with Governor Brisbane as Patron and Judge Barron Field as President, while Alexander Berry and Edward Wollstonecraft became joint secretaries. There had been an earlier attempt to form an agricultural society but this foundered because Governor Macquarie had insisted that emancipist farmers should be admitted as members, a proposal that was unacceptable to the 'exclusives' (Phillips 1909).[5] The primary objective of the Agricultural Society was to increase the quality and numbers of productive animals in the colony, which reflected a major interest of the former Philosophical Society members. However, like the Philosophical Society, the Agricultural Society soon disbanded, although it was later revived to become a forbear of the present Royal Agricultural Society.

Even if there had been no personality conflicts within the Philosophical Society of Australasia it probably would not have long survived. By 1825 four of the members had left the colony, and another one died soon afterwards.

[4] William Whewhell, of Trinity College, Cambridge used the term at a meeting of the British Association in 1833.

[5] Emancipists were former convicts who had served their sentence or been pardoned.

Three diverted their attention elsewhere – Dr Douglass, Alexander Berry, and Edward Wollstonecraft all became active in other cultural organisations. One of these was the Australian Subscription Library, founded in 1826. This was a direct ancestor of the present State Library of New South Wales, and because it included Governor Brisbane's scientific library, we can link its origins to the Philosophical Society. Brothers-in-law and business partners Berry and Wollstonecraft were the joint treasurers of the library, and three other Philosophical Society members became successive Presidents. With this direct connection, it is more plausible to describe the State Library, rather than the Royal Society, as the legitimate descendant of the Philosophical Society (Richardson 1951).

Purely scientific activity in Australia seemed to be concentrated in Van Diemen's Land for the next few years, particularly during Sir John Franklin's term as Governor from 1837 to 1843. Franklin was a notable navigator and explorer, whose expedition was lost in 1847 while searching for a Northwest Passage between the Pacific and Atlantic oceans. The Van Diemen's Land Scientific Society founded in 1829 became the Royal Society of Tasmania in 1843, the oldest Royal Society outside the British Isles.

One reason that cultural societies did not flourish in New South Wales during the 1840s is because Australia suffered its first economic depression in that period, hard on the heels of a severe drought. Several banks failed and the overseas commodity markets (particularly wool) collapsed. Squatters resorted to boiling-down their sheep for tallow. And shades of the 'Global Financial Crisis' 160 years later, there had been too much borrowing on limited security (Bassett 1993). These circumstances particularly affected the very people who had intellectual pretensions. Nevertheless, there was still some official scientific activity at the Botanic Gardens and The Australian Museum, which had been founded in 1836. In both these organisations a majority of the board members or trustees also held membership of one of the Philosophical Societies at some stage. The educated community was very small, so it was inevitable that the same names would appear in many places.

THE AUSTRALIAN (PHILOSOPHICAL) SOCIETY

After the Philosophical Society of Australasia collapsed, it was nearly thirty years before a similar society came into being in New South Wales in June 1850. Only two members of the defunct Philosophical Society, Henry Grattan Douglass and Alexander Berry, became members of the new body which was called The Australian Society for the Encouragement of Arts, Science, Commerce, and Agriculture, commonly known simply as 'The Australian Society'. The title indicates that it had a much wider brief than the original body. Dr Douglass became joint honorary secretary, and he always referred to it as the Australian Philosophical Society to emphasise its extremely tenuous connection with the original Philosophical Society of Australasia, which largely rested on the fact that he was secretary of both. Regrettably, no minutes or other documents of this society survive, so we must rely on press reports or incidental correspondence to reconstruct its accomplishments. Sixty people attended the inaugural meeting, so it evidently filled a need, though the attraction may have been commercial rather than scientific, as shown when several men observed that good cedar trees were no longer found within hundreds of miles of Sydney. Only about half of those present appear to have actually joined the Society.

In 1984, former Royal Society President Dr Alan Day, together with his wife Judy Day compiled a biographical register of members of the Australian Philosophical Society and the Philosophical Society of NSW, that was published in two parts in the *Journal and Proceedings* (Day 1984, 1996). This laborious task was carried out by hand on index cards, in the days before personal computers were available. Amongst the difficulties they encountered, Dr Day mentioned that 'the registration of members ... appears to have been haphazard.' Even the membership lists printed in the *Journal and Proceedings* do not tally with the membership registers or the Society minutes. In the twenty-five years since then, more sources of information have become available, but there are still some gaps in the

data. Using computer databases has simplified the task of cross matching membership lists with other organisations in the colony in the mid-nineteenth century.

During its five years of existence, forty-four men became members of The Australian Society. Ten were lawyers, eight were medicos, five were engineers or surveyors, five were merchants, while the remainder were clergymen, public servants, teachers and pastoralists. The only one who could be called a scientist was Charles Moore, Director of the Botanic Gardens. Twenty-two were born in England, eight in Scotland, and only two were born here. Of the forty-four members, twenty-three were, or became, Members of Parliament, mainly appointed rather than elected Members of the Legislative Council. Obviously they were all part of the colonial élite.

THE PHILOSOPHICAL SOCIETY OF NEW SOUTH WALES

Mid-century was not a propitious time to form a new association. With the announcement in 1851 that gold had been discovered in the Bathurst region, interests shifted elsewhere. The Australian Society appears to have struggled until several of the scientifically oriented members decided to remodel it as the Philosophical Society of New South Wales in 1856. The decision was made at the last meeting of the Australian Society on 30 July 1855, but the new organisation did not hold its first meeting until the following year. Prominent amongst the activists was Rev. W.B. Clarke, who as Manning Clark observed in his *History of Australia* was 'on weekdays a geologist and on Sundays a man of God.' (Clark 1987). The ubiquitous Henry Douglass and Alexander Berry were involved once again, as were prominent business men such as John Fairfax and Thomas Sutcliffe Mort.

Berry makes an interesting case study. He is the only person to be a member of each of the four incarnations of the Royal Society. Born in Scotland and trained as a surgeon, he became a merchant and shipowner when he settled in Australia in partnership with Edward Wollstonecraft, whose sister he later married. Through grants and purchase he acquired 40,000 acres on the Shoalhaven, but by the time the Philosophical Society of NSW started, Alexander Berry lived on the north shore at Crow's Nest while his brother David managed the south coast farms. Irascible and litigious, he was one of the richest men in the colony, and he was an inveterate joiner, holding office in several cultural bodies at the same time.

However, the real driving force behind the formation of the new Society was the Governor, Sir William Denison who became its first President. Denison was an autocratic English aristocrat by birth, but he was also a man of science. Trained as an army engineer, he was knowledgeable about astronomy, geology and conchology. He had been Lieutenant-Governor of Van Diemen's Land before coming to NSW in 1855 and had noted that:

The great evil of these colonies is the absence of scientific men. Many of the settlers have had some education, but there are but few or none in this colony who can fairly be called men of science, and the consequence is that the half-educated, with but a smattering of knowledge, are able to lead the more ignorant by the nose.
(Denison 1870)

The Philosophical Society of New South Wales got off to a flying start. The gold rush had settled down, so 160 members joined in the first year, including twenty-four who transferred from the Australian Society, bringing with them the small cash reserves from that body.

During his term of office, Governor Denison presented seven papers before the Society including one on railways. This was rather foresighted considering that the first railway line in the colony, from Redfern to Granville only opened the year he arrived. The big development during Denison's term, however, was the introduction of responsible government in 1856. Once again the colony was thrown into turmoil as competing factions jostled for power in an elected Parliament, and intellectual affairs moved to the bottom of the public agenda for a time. There were three Ministries in the first twelve months. Denison left the colony at

the beginning of 1861, when he was posted to Madras (Bennett 2009). Interest in the Society steadily declined after he left.

During the eleven years that it functioned, 309 individuals became members of the Philosophical Society of NSW. 60 were businessmen, 48 were engineers, 36 were medicos, 35 were lawyers, 18 were clergymen. Two brazenly described their occupation as 'gentleman'. Sixty of them (19.4%) were, or became Members of Parliament. As one would expect by mid-century, more of the members (12%) were now born in Australia, although they were outnumbered by the Scots and the Irish who each numbered around 14%, while just half the members (49.7%) were English-born. Although this third incarnation of a scientific society had grown substantially, and the range of occupations is broader, in line with the growth in population, it still remained an exclusive body. But after eleven years the resuscitated Society in turn languished, prompting discussion about possible strategies to develop a lasting and effective organisation to promote science. As Joseph Dyer the editor of *The Sydney Magazine of Science and Art* wrote in 1859, in the second (and final) issue of the journal:

... the constant attention to business, which is characteristic of colonial life, appears very unfriendly to the development of a taste for science, literature and art... in a community where politics, professional occupations or mercantile pursuits engross nearly the whole population. (Dyer 1859).

THE ROYAL SOCIETY OF NEW SOUTH WALES

Eventually the model of the Royal Society of London was favoured. That institution had been founded in 1660 after the Restoration of Charles II, and became probably the most prestigious scientific association in the world. Already two of the other Australian colonies – Victoria and Van Diemen's Land – had created local Royal Societies from the remnants of previous philosophical societies. So after considerable lobbying, Queen Victoria gave her Royal Assent in December 1866 for the Philosophical Society of New South Wales to be known as The Royal Society of New South Wales. To ensure its legal status, the Society was formally incorporated by a special Act of the New South Wales Parliament in 1881 'for the encouragement of studies and investigations in Science, Art, Literature and Philosophy'.

It is a revealing exercise to compare the stated aims and objectives of the four societies, as well as the subsequent amendment when the Royal Society was incorporated by Act of Parliament in 1881. These show how perceptions of the several iterations changed over a period of sixty years (Table 2).

It was the Rev. W.B. Clarke at the inaugural meeting of the Royal Society in July 1867 who claimed its origins lay in the 1821 Philosophical Society of Australasia, although he conceded that it had been more a scientific club than a formal association, and it appears to have survived for only a little over a year. Clarke said that 'After a long interval of silence and inactivity' this became the Australian Philosophical Society, which in turn 'resolved to remodel the Society under the territorial title of New South Wales' in 1855 (Clarke 1868). Professor John Smith in his 1881 Presidential Address expressed reservations about Clarke's claim, but Professor Archibald Liversidge perpetuated the legend when he designed the Royal Society emblem in 1888, which unequivocally proclaims that the Society was 'Founded 1821'.

In my view, we can claim direct descent only from Governor Denison's 1856 Philosophical Society of NSW, and possibly through that to The Australian Society of 1850, but even that is debatable. Some individuals were members of the successive societies, but as I have shown, they were also members of numerous other cultural bodies during the same period. The only common ground that I can discern is the restriction of membership to respectable gentlemen.

Perhaps it doesn't really matter to members in the twenty-first century whether the Society originated in 1866, 1856, 1850, or 1821. As we move further away from those dates it appears less important to trace our genealogy; we now have accumulated a long and proud heritage, with at least 145 years of continuous support for science.

Aims and Objectives Philosophical Society of Australasia (1821)	'Formed with a view to inquiring into the various branches of physical science of this vast continent and its adjacent regions; and the mineralogical and geological state of these countries form primary objects of the Society.'
Australian Philosophical Society (1850)	The full title of this society described its objectives: 'The Australian Society for the Encouragement of Arts, Science, Commerce, and Agriculture.'
Philosophical Society of New South Wales (1856)	'The object of the society is to receive at its stated meetings, original papers on subjects of science, art, literature, and philosophy.'
Royal Society of New South Wales (1867)	'The object of the Society is to receive at its stated meetings original papers on subjects of Science, Art, Literature, and Philosophy, and especially on such subjects as tend to develop the resources of Australia, and to illustrate its Natural History and Productions.'
Act of Incorporation (1881)	'For the encouragement of studies and investigations in Science, Art, Literature, and Philosophy.'

Table 2. The stated aims and objectives of the four societies, as well as the subsequent amendment when the Royal Society was incorporated by Act of Parliament in 1881.

Fifty-eight of the Philosophical Society of NSW members transferred to the re-named Royal Society in 1866, including the venerable Alexander Berry, then aged 85. Within twelve months they were joined by another 50 members, bringing the total to 108 at the end of the first year of activity. The Society began publishing its annual *Transactions* the following year, containing the texts of original papers presented at the monthly general meetings of members. Unsurprisingly in a developing colony, the early contributions tended to be in fields of applied science such as railway engineering or water supply rather than theoretical speculation.

Membership grew steadily for the next ten years, reaching 176 by 1876. In that year the Society moved into its first permanent home, at 5 Elizabeth Street, opened its own scientific lending library, and, most importantly, formed specialist Scientific Sections catering for each of the main disciplines. Membership then increased dramatically and by 1879 exceeded 400. It almost reached 500 before slowly dwindling to 374 at the end of the century. In addition to these elected members, there were up to twenty-five honorary or corresponding members in this period.

Many of these people do not seem to have been very active. Minutes of business meetings or lecture reports do not list the names of those who were present, giving only a general comment like 'about thirty' or 'well-attended'. Professor Liversidge in his 1886 Presidential address remarked on the small number of original papers submitted to the Society. Out of nearly 500 members, only 35 had contributed papers, and most of these were from 7 or 8 people (Liversidge 1886).

Looking at the members of the Royal Society during its first five years there appears to be a shift in the background of members, but this may be misleading. There was a total of 309 people involved in the ten years of the Philosophical Society's existence, but only 172 were involved in the first five years of the Royal Society, and we have not yet traced the backgrounds of all these men. However, we can say that thirty-eight of them (22%) were Members of Parliament at some stage in their lives, a slightly greater proportion than in the earlier Society.

Under the influence of Presidents and Secretaries such as W.B. Clarke, Professors John Smith and Archibald Liversidge, Government Astronomer H.C. Russell and the geologist Sir T.W. Edgeworth David, the Royal Society displayed a strong emphasis on the physical sciences in its discussions, particularly geology, palaeontology and mineralogy, although the life sciences were not neglected. In that way the aims of the original Philosophical Society of Australasia were realised. People whose primary interests were in the fields of botany, biology and zoology formed the Linnean Society of New South Wales in 1874 under the guidance of Sir William Macleay. Nevertheless, many people were members of both societies because nineteenth-century science did not follow the rigid demarcation lines we know today, while the two societies themselves maintained a close relationship for many years.

There was a group of distinguished scientific scholars who became Presidents of the Royal Society in the closing years of the century, most of them on more than one occasion (Table 3).

1861-1878	Rev. W.B. Clarke*	Geology
1879-80; 1883	Professor John Smith	Physics
1881; 1884; 1891; 1901	H.C. Russell	Astronomy
1882; 1886	Christopher Rolleston	Statistics
1885; 1889; 1900	Professor A. Liversidge	Chemistry
1887	C.S. Wilkinson	Geology
1888	Sir Alfred Roberts	Medicine
1890	Dr A. Leibius	Chemistry
1892; 1902	Professor W.H. Warren	Engineering
1893; 1906	Professor T.P. Anderson Stuart	Physiology
1894	Professor R. Threlfall	Physics
1895; 1910	Professor T.W.E. David	Geology
1896; 1911	J.H. Maiden	Botany
1897; 1907	Henry Deane	Engineering
1898	G.H. Knibbs	Mathematics
1899; 1908	W.H. Hamlet	Chemistry

Table 3. Distinguished scientific scholars who became Presidents of the Royal Society.
W.B. Clarke was actually Senior Vice-President, the NSW Governor being President until 1879.

There were other notable scientists who were members of the Society in this period, but who never attained elected office – Gerard Krefft, Lawrence Hargrave, John Tebbutt, for example. In fact some of them were highly critical of the little clique of rotating Presidents who they believed 'have had it all their own way for years and cannot brook the slightest opposition.' (Orchiston 2001).

Unlike its counterpart in Victoria, which encouraged Antarctic exploration and backed the ill-fated Burke and Wills expedition, the Royal Society of New South Wales did not engage directly in scientific research or exploration. Instead, it preferred to foster independent local discovery through liaison with other organisations and by its program of meetings, symposia and publications dedicated to the furthering of knowledge. It also offered prizes and the Society's Medal for essays based on original research in specified subjects. Later it began recognising distinguished scientific achievements through annual awards such as the prestigious Clarke Medal, first awarded in 1878.

In the nineteenth century the Royal Society of New South Wales was not the provincial intellectual outpost that many observers have assumed. Science in NSW did not simply serve a grand scheme for enhancing the prestige of the British Empire. Some individuals may have had that objective, as the title of Roy Macleod's recent biography of Archibald Liversidge might suggest – *Imperial Science Under the Southern Cross* (Macleod 2009). This may be particularly so of British-born members like Liversidge, but as the century moved on more and more of the members were born here and thought of themselves as New South Welshmen rather than transplanted Englishmen. Certainly, some may have had sentimental feelings towards a 'Home' they rarely, if ever visited, but others were firm nationalists who asserted themselves as equals of anybody from the other side of the world. Men such as astronomer John Tebbutt and aeronautical pioneer Lawrence Hargrave made significant original contributions in their fields. It is not their science that was provincial, but their social status in the international hierarchy.

Members read the latest overseas journals diligently, they collected specimens and published papers – often descriptive rather than analytical – and they engaged in vigorous discourse on many of the contentious issues of the period, including Darwin's theories of species evolution at a time when such views were deeply unpopular in Australia. On the other hand, one can fairly say that Australians were naturally drawn more to empirical scientific investigation than to theoretical speculation. That reflects the materialism of the society in which they lived.

AN EXCLUSIVE CLUB?

During the nineteenth century the Royal Society of New South Wales functioned like an exclusive gentlemen's club. Membership was strictly controlled, limited to a maximum of 500 (never quite achieved, but reaching 494 in 1884-5). The only qualification was that they should be men of 'honourable reputations and ... a friend of science.' Note that by then the constitutional references to literature, art and philosophy were being ignored, as was mention of such crass occupations as commerce or agriculture. Candidates were nominated and seconded by existing members or prominent citizens whom they knew personally, and each nomination was placed on the table for three consecutive general meetings to allow objections to be raised, before members finally voted on whether or not to accept the candidate (Royal Society 1889).[6] At least twenty members had to attend the meeting when the election took place, and eighty per cent of those present had to vote in favour. Having jumped those hurdles, the prospective member was then required to sign a statement in the Obligations Book that he would '*endeavour to promote the interests and welfare of the Society, and to observe its Rules and Bye-laws*'.

The Royal Society in London from its inception was closely linked with Freemasonry. King Charles II was a Mason, and virtually all the early Fellows were members of the craft, so much so that the Royal Society was known as 'The Secret College'. This meant that Roman Catholics had little prospect of becoming members; indeed for the first three decades of the nineteenth century one had to be a communicant of the Church of England to attend one of the English Universities, so Catholics rarely possessed the educational background to become scientists. However, the Royal Societies in Scotland and Ireland catered for men of other faiths, or none, and so we find many distinguished Fellows amongst those Societies.

Governor Macquarie was a Mason, and his regiment formed a Lodge in Sydney in 1814, while the first civilian Lodge was formed in 1820. We know there were a number of Masons amongst the Royal Society members, although because of the nature of the brotherhood it is difficult to quantify this. Freemasonry has always been regarded as 'a passport to convivial society, moral and spiritual refinement, material assistance, and social advancement,' (Harland-Jacobs 2007) and gained a strong grip in the worlds of commerce, the public service and the army. Perhaps freemasonry was less influential

[6] The rules later were relaxed slightly, so that nominations only had to presented to two general meetings.

in the Sydney Royal Society than in its London counterpart because Australia has always been a more diverse community. Amongst the Royal Society members in the nineteenth century we find people born in Scotland, Ireland, Germany, USA, and their known religious affiliations include Presbyterians, Unitarians, Lutherans and Jews as well as many Anglicans and Catholics. The Royal Society may have been regarded as fulfilling a similar function as a Masonic Lodge without the paraphernalia and ritual.

In the New South Wales context, the most significant correlation to another exclusive gathering was membership of the Australian Club which was founded in 1838. Fourteen of the original members (including Alexander Berry) were members of earlier versions of the Royal Society. The one big difference is that until the 1890s trade was an occupation that was frowned on in the Australian Club, while it formed a major part of the Royal Society membership (Angel 1988). The slightly less-prestigious but equally exclusive Union Club was founded in 1857, and eleven of its founding office-bearers – including Dr Douglass – were members of the Philosophical Society of NSW. Admission to these clubs was even more rigorous (and expensive) than the Royal Society, and to become a member guaranteed one a certain social cachet.

WOMEN AND THE ROYAL SOCIETY

The wives and daughters of gentlemen were, by definition, ladies, but this was irrelevant to the Royal Society during the nineteenth century, when female persons, whether or not they were ladies were not admitted to the monthly scientific meetings. There was a prevailing assumption that women were essentially frivolous creatures. Libraries often had separate reading rooms for women, adjacent to the romantic novels. Some men contested the mere presence of women in a library, because they were an 'irresistible distraction' (Mirmohamadi 2009).

Despite the irony in the fact that Queen Victoria gave her assent to its formation, women could not become members of the Royal Society of New South Wales until 1935, although they achieved the electoral franchise in 1902. The first woman to be elected President was palaeontologist Dr Ida Brown in 1953. The next, and only other female President was Karina Kelly in 2003-4. During the nineteenth century some enlightened members proposed that women should be permitted to join, pointing out that 'ladies are neither uninterested nor inappreciative of science'[7], but these moves were overwhelmingly defeated by the paternalistic majority. Fanny Hunt became the first female science graduate at the University of Sydney in 1888, but could not join the Royal Society, although occasionally papers written by women graduates were read by male colleagues on their behalf. By contrast with the stereotypes of conservative Melbourne and brash Sydney, the Royal Society of Victoria admitted women from 1889, (Pescott 1961) as did the Australian Association for the Advancement of Science from its inception in 1888.

Nevertheless, there were many women who took an active part in scientific activity throughout the nineteenth century, often behind the scenes in support of their husbands, but sometimes alone. They arranged insect displays, collected shells, pressed flowers and above all made detailed and beautiful illustrations of birds, animals and plants. Painting and drawing were acceptable pursuits for ladies, and many excelled at it.

One activity where women, or at least ladies, were welcome was the annual *Conversazione.* Such social gatherings held in a cultural setting were a feature of nineteenth-century life throughout the British Empire. The Philosophical Society of NSW held one as early as 1859 to demonstrate the relatively new art and science of photography, but from 1874 they became a yearly event for the Royal Society of New South Wales, capitalising on the huge interest in science and technology generated by the 1870 Intercolonial Exhibition in Sydney. Originally held in the Masonic Hall – significantly, perhaps – these *Conversaziones* moved to the University after the Great Hall was completed. Exhibits

[7] This comment was made by Government Astronomer and Royal Society President George Smalley in his 1868 Presidential Address, published in the *Transactions* for that year.

of scientific equipment and the latest inventions lined the walls, while practical demonstrations took place in University lecture theatres or laboratories. Up to 1,000 men and women in evening dress promenaded around the illuminated buildings, consuming suitable refreshments to the accompaniment of light classics played on the organ or by the military band. Members' wives and older daughters proudly displayed their finery – often the latest French fashions. Until World War I, this was one of the most important events in Sydney's social calendar, reported in great detail in the newspapers.

PROMOTION OF SCIENCE

While the Royal Society catered for gentlemen, there was a parallel organisation for the craftsmen and artisans who were known collectively as 'mechanics' in the nineteenth century. This was the Sydney Mechanics' School of Arts founded in 1833, based on a Scottish model. Its objects were to provide further education for working men by 'the intellectual improvement of its members and the cultivation of literature, science and art.' During its first twenty years, the School of Arts President was invariably a Philosophical Society member, and the name of Dr Douglass again appears on the lists, as Vice-President. Eight other Australian Philosophical Society members served on the School of Arts committee during the 1850s, while several members lectured there. The School of Arts in Pitt Street was a forerunner of Sydney Technical College, and contained a library, technological museum, and chemistry laboratory as well as lecture halls.

The Royal Society's move into permanent premises at 5 Elizabeth Street in 1875 enabled it to establish a scientific lending library and reading room.In 1876 the previously published *Transactions* became the *Journal and Proceedings of the Royal Society of New South Wales*, which has appeared without interruption since then. This journal is still exchanged with more than 400 scientific institutions throughout the world. Some of these publications are the only copies in Australia.

After settling into its new home, the Royal Society also launched its Scientific Sections in 1876. These were groups of members with a specialised interest who met monthly to discuss the latest developments in their sub-discipline, whether this be agriculture, architecture, astronomy, biology, chemistry, engineering, ethnology, fine arts, geography, geology, literature, mathematics, medicine, microscopy, physics or public health. Gradually separate societies or professional associations in their particular fields replaced those Sections when there were enough practitioners to create an independent body. Indeed, one of the great contributions of the Royal Society of New South Wales to Australian science has been its function as progenitor and mentor for a host of other associations, such as the Institution of Engineers Australia and the British Medical Association, NSW Branch. Professor Liversidge as President devoted himself to the creation of the Australasian Association for the Advancement of Science in time for the centenary celebrations of 1888. That body eventually grew into the Australian Academy of Science, which incidentally only elected its first female president, Professor Suzanne Cory, in May 2010.

The Royal Society began a series of regular Science Lectures in 1900. They were initially restricted to members but soon welcomed everybody, in a move to reach a wider audience. According to press reports, these 'Popular Science Lectures' were well attended, with men and even women sometimes turned away due to lack of room.

SUMMARY

During the nineteenth century, members of the Royal Society were part of the colonial conservative establishment. As we have seen, women were excluded, while rigorous admission procedures ensured that 'working men' did not become members. It would be easy to characterise the members as typical class-conscious paternalists of the Victorian era, but there were always a few dissenters who did not fit that model. Nevertheless, the Royal Society recognised the need to educate or inform

the broader public about the achievements of science, and organised regular gatherings for that purpose. For some, this may have been due to a sense of *noblesse oblige*, but for many it was through a desire to share their passion.

But why else did these men become members? Most did not have any obvious scientific knowledge or understanding. The Royal Society provided a sense of community and the opportunity for fraternising with men of similar social status and traditionalist values, but it did not offer refreshments and accommodation like the exclusive gentlemen's clubs which many of them belonged to as well. It certainly would have been useful for professional and commercial networking. At the periods when a Colonial Governor was actively involved, there was some social cachet attached to mixing in those circles. Above all, it would have offered an evening of relief from domestic responsibilities – 'a tree house for boys', as a later commentator tartly observed. After 1867 the publications would have been an attraction. Membership was at its peak in the period when the Scientific Sections were active, so undoubtedly some men joined just so they could participate in discussions of the latest developments in their professional field, and in due course they founded separate associations for this purpose. In reality, of course, only a small proportion of the members actually attended the monthly meetings – on my estimate, probably around ten per cent. And when you come to think of it, the same ratio still prevails today, so we might ask the same questions now, although at least there are now many women in our midst.

During the twentieth century more inclusive attitudes emerged gradually, reflecting the changes in the wider community. Today it is difficult to discern any remnants of the earlier caste system. At the same time, the influence and public profile of the Royal Society appears to have diminished. No longer can we read detailed reports of our monthly meetings in the *Sydney Morning Herald* and *Daily Telegraph.* No longer does the Senate of the University of Sydney meet in the Royal Society premises. And for much of the community the very idea of science seems to have lost some of its gloss.

So perhaps we should echo the sentiments of Rev. W.B. Clarke at the inauguration of the Royal Society in 1867. After despairing of the younger generation, who he said are only interested in 'the frivolities of ephemeral excitement' Clarke quoted John Milton:

'Let me fit audience find, though few.'[8]

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Dr Peter Tyler, BA, MLitt, PhD, GradDipAdEd, HonFAIEH, MPHA
Consultant Historian, Peter J. Tyler Associates
Email: ptyler@bigpond.net.au

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Thesis Abstract: Development of Novel Nanostructured Conducting Polypyrrole Fibres

JAVAD FOROUGHI

Abstract of a Thesis submitted for a Doctor of Philosophy
University of Wollongong, 2009

Polypyrrole (PPy) as a conducting polymer has potential applications in electrical and electronic devices because of its high electrical conductivity, environmental stability and redox activity. There have been many attempts to endow electrically PPy with processibility. Although some success has been achieved via synthesising soluble PPy, there have remained difficulties to fabricate this material through fibre spinning due to its low molecular weight and poor mechanical properties. Prior to this thesis, there was no report of the production of PPy fibres. This project therefore aimed to produce novel "polypyrrole fibres via the development of nanostructured conducting polypyrrole" by fibre spinning of PPy and to investigate the formed fibres for applications such as actuators, e-textiles, batteries, sensors and biomedical areas.

As a result of the research conducted for this thesis, polypyrrole fibres have been produced for the first time. The initial wet-spinning process was enabled by the use of highly soluble non-functionalised PPy using di-(2-ethylhexyl)sulfosuccinate (DEHS) dopant, and the generation of a spinning solution of the PPy-DEHS in dichloroacetic acid (DCAA) solvent. Subsequent work sought to improve the properties of these first generation PPy-DEHS fibres by increasing the molecular weight, addition of carbon nanotubes (CNTs) and addition of a supporting polymer (alginate). The use of the host polymer also enabled a new fibre spinning method to be developed that included an *in situ* polymerization process. Carbon nanotubes additions were achieved in two ways: firstly by adding small amounts of CNTs to the spinning dope; and secondly, a completely novel approach was developed whereby PPy was polymerized onto and into a CNT yarn.

Each of the methods used to generate PPy fibres gave different performances in terms of mechanical strength / stiffness, electrical conductivity and electroactivity. Generally, it was found that adding of carbon nanotubes to the PPy improved the strength, stiffness and conductivity. The highest conductivity and Young's modulus of any conducting polymer based fibre reported to date was obtained by incorporating PPy into a CNT yarn. The more robust fibres were assessed as mechanical actuators and a maximum strain of 2.5% was produced from the high molecular weight PPy-DEHS fibre.

In summary, a range of novel fibrous PPy materials have been developed for possible use in applications such as actuators, sensors, artificial muscles, batteries and biomedical applications. The main aim of the thesis was to develop methods for continuous production of doped PPy fibres. This aim was successfully completed with a variety of different fibre compositions and properties demonstrated using a range of different fibre processing methods.

Dr Javad Foroughi (Associate Research Fellow)
ARC Centre of Excellence for Electromaterials Science
Intelligent Polymer Research Institute
AIIM Facility, Innovation Campus, University of Wollongong
Wollongong NSW Australia 2522
Email: foroughi@uow.edu.au
ACES website: http://www.electromaterials.edu.au
IPRI website: http://ipri.uow.edu.au

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Thesis Abstract: An Investigation of the Continuum of Care as Experienced by Victorian Adults with Moderate to Severe Traumatic Brain Injury and their Significant Others

A.M. O'CALLAGHAN

Abstract of a Thesis submitted for a Doctor of Philosophy
Charles Sturt University, Albury, New South Wales, 2010

In recent years there has been a move towards the application of clinical care guidelines founded on evidence-based best practice in the provision of health services. Health services, departments and clinicians have been encouraged to use guidelines to formulate service-specific protocols, clinical pathways and care plans which help ensure efficient and effective service provision. The availability and implementation of these guidelines has been shown to lead to significant improvements in the processes as well as the outcomes of care (Bulger et al., 2002; Fakhry, Trask, Waller & Watts, 2004; Faul, Wald, Rutland-Brown, Sullivent & Sattin, 2007; Spain et al., 1998).

Clinical care guidelines outlining evidence-based treatments in acute care following traumatic brain injury (TBI) are numerous (Brain Trauma Foundation, 2003, 2005, 2006, 2007, 2008a; Maas et al. 1997; National Institute for Clinical Excellence, 2007). International TBI rehabilitation guidelines are also available (British Society of Rehabilitation Medicine & Royal College of Physicians, 2003; New Zealand Guidelines Group, 2006; Turner-Stokes, Disler, Nair & Wade, 2005). However Australian guidelines targeting long-term TBI rehabilitation are non-existent. In addition, there has been limited research into current trends in TBI service provision in Australia.

It was the aim of this study to compare "international best practice" as described in TBI rehabilitative guidelines with reported current practice in Australia. In this way, gaps in best practice were identified and steps were proposed to improve service provision. It is hoped that this research will help inform the development of Australian specific TBI rehabilitation clinical care guidelines.

This two stage mixed methods study investigated the continuum of care experienced by adults with moderate to severe TBI and their significant others. In Stage 1, the reported experiences of 202 adults with TBI and 184 significant others were surveyed via a Victorian state-wide questionnaire. In Stage 2, 14 adults with moderate-severe TBI and 9 significant others were interviewed. The findings from these two stages were synthesised.

The results indicated that very few of those surveyed reported receiving health services in line with international clinical care guidelines. Participants reported significant gaps in service provision, including lack of specialist services, limited involvement in guiding their care, poor monitoring following discharge from formal services, limited involvement in transition planning, variations in access to care according to funding, and poor access to support upon community integration after discharge from formal services. Nevertheless, interestingly, those with TBI and their significant others were largely satisfied with the services received.

In the interviews completed with adults with TBI and their significant others several themes were identified which described influences on people's ability to access services over time. These themes included: (a) their acceptance of head injury and readiness to engage in therapy, (b) their ability to access constant support, (c) their and others' roles in advocating for services, (d) their ability to access the right service at the right time, and (e) the degree of match between their and others' expectations with

regard to services provided, treatments recommended, staff specialty and expected outcome.

Both the adults with TBI and their significant others acknowledged the significant physical, emotional, behavioural and cognitive changes they experienced as a result of their head injury. They also spoke about the impact of these changes on their quality of life. Given their impairments, participants stressed the importance of being able to access timely, coordinated, specialist rehabilitative services to maximise their ability to cope and re-integrate into the community following discharge from hospital.

Consequently, a model to guide service provision was proposed, demonstrating the fluidity and integration of client access related factors across time to help ensure the judicious provision of rehabilitative services to adults following moderate to severe TBI. This model adds to international best practice rehabilitative guidelines by considering timing and personal factors in the implementation of appropriate services. It is proposed that in order for adults with TBI to achieve the best possible outcomes following rehabilitation, services must be allocated appropriately without time limitations.

A.M. O'Callaghan
BHlthSc(SpeechPath)(Hons), PhD
Charles Sturt University
Email: aocallaghan@csu.edu.au

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Thesis Abstract: Slow Light in Coupled Periodic Photonic Structures

SANGWOO HA

Abstract of a Thesis submitted for a Doctor of Philosophy
Australian National University, 2010

Slow light has established itself over the past decade as one of the most active research fields in multiple disciplines. Intrigued by its fundamental science and practical application of delay for all-optical signal processing and many others, various approaches for reducing the group velocity – including periodic photonic structures – have developed the key principles of achieving individual slow-light states. To contribute to the cause, we propose new approaches for light manipulation based on the interaction between multiple slow-light states in coupled periodic waveguides.

We first study Bragg grating couplers and reveal that if the gratings are shifted longitudinally, ideally by half a period, two different slow modes exist near the photonic band-edge. In the linear regime, the interaction manifests in the form of slow-light tunnelling between the waveguides, and we experimentally measure the transmission from directly laser-written structures to demonstrate the precise control of the shift needed for observing such phenomenon. In the nonlinear regime, we can control the optical power to compensate for dispersion-induced broadening of pulses through the formation of gap solitons, switch the output between the waveguides, and tune the delay simultaneously. We find that the conditions for slow-light tunnelling are in fact generic and can be satisfied similarly in other antisymmetrically coupled periodic structures. Such a slow-light regime, as our studies reveal, is unique in that it features non-vanishing vortex energy flows inside the structure even at zero group velocity. In antisymmetric photonic crystal couplers, the frequency-independent, short coupling length allows dispersionless tunnelling of slow-light pulses.

Experimental study of slow light in periodic waveguides requires accurate data analysis, and the spatial Fourier analysis is conventionally used for extracting the dispersion relations from measurements with near-field scanning optical microscopy.

However, its resolution in k-space is inversely proportional to the length of the structure. By using the properties of Bloch-wave symmetry, we develop a general approach that has no inherent resolution limit. Furthermore, it can extract both the real and the imaginary parts of the wavenumber and the spatial profiles of the individual modes, none of which is possible with the spatial Fourier analysis. We demonstrate these abilities by analysing numerical and experimental data for short slow-light waveguides that support multiple propagating and evanescent modes.

Finally, we present the first experimental proof of principle for slow-light tunnelling, in antisymmetrically coupled array of pillars scaled to operate at the microwave frequencies. We apply our Bloch-mode extraction method to retrieve the dispersion relations and the two-dimensional profiles of the individual modes. Such structures also act as side-coupled cavities and we show that breaking the structure symmetry through the longitudinal shift adds another degree of flexibility in controlling the frequency detuning between cavity modes. Shifted cavities allow nontrivial coupling between two pairs of counter-propagating waves due to split band-edges, and we experimentally confirm that this leads to the reduction of the detuning, even down to zero. Our results suggest new possibilities for light manipulation based on the interaction between multiple slow-light states, including resonators, nonlinear wave mixing, and switching in tunable structures.

Sangwoo Ha, PhD, Nonlinear Physics Centre
Research School of Physics and Engineering
Australian National University
Email: sangwoo.ha@gmail.com

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Thesis Abstract: An Appraisal of the On-farm Water and Energy Nexus in Irrigated Agriculture

TAMARA JACKSON

Abstract of a Thesis submitted for a Doctor of Philosophy
Charles Sturt University, 2009

Irrigators are currently facing a number of challenges, including reduction in water availability, increased competition for limited water resources, fluctuating energy prices and more stringent environmental regulations. Irrigated agriculture is the largest water user both worldwide and in the Australian context, and there is pressure on irrigators to improve water use efficiency in order to make more water available for other sectors. One way of improving water use efficiency is to install more efficient pressurised irrigation systems. However, optimising for water use efficiency may have unintended consequences, such possibly increasing in energyăuse and therefore higher greenhouse gas emissions. There is limited data available regarding the nexus between water and energy consumption and greenhouse gas emissions associated with crop production in Australia. This work is aimed at determining water use efficiency, energy consumption and greenhouse gas emission relationships for different irrigation systems, and the ways in which uncertainty of different parameters impact on these relationships.

Two Australian irrigation areas were studied: a surface-water supplied region in New South Wales; and a groundwater dependent region in South Australia. The water and energy budgets for crop production from land preparation to harvest were quantified on several farms. This data was integrated in an accounting model run in Microsoft Excel. The result is a model of water application and energy consumption at the field scale that describes the relationships between water (source and application rate), energy, irrigation method, climate and soil characteristics. This model was linked to the @Risk software to determine the level of uncertainty related to water and energy consumption and carbon equivalent emissions, based on possible variability in the environmental and operating inputs.

Results showed that there was a general trend of increasing energy consumption with increasing water use; this trend was more pronounced in groundwater dependent regions. Where conversions are made from gravity to pressurised irrigation methods, water consumption is reduced but there is an increase in energy consumption and greenhouse gas emissions, especially in surface water irrigation regions. In groundwater dependent irrigated areas, the opposite is true; the use of pressurised irrigation methods can reduce water and energy consumption and greenhouse gas emissions. In addition to this, the source of energy used for pumping and pressurising irrigation water influences the level of emissions; in Australia, the use of electricity is associated with much higher emissions than with the use of diesel.

The results presented in this thesis provide valuable knowledge relating to the farm scale water-energy nexus in the Australian context. On the basis of this study, it is recommended to increase irrigation efficiency in groundwater dependent systems to reduce energy inputs and greenhouse gas emissions. In the case of surface water sourced irrigation regions, efficient gravity based irrigation methods coupled with good management practices are recommended to conserve water and energy and reduce greenhouse gas emissions. Simplified tools aimed at promoting comprehensive understanding of the water-energy nexus are essential to allow irrigated agriculture to keep pace with production requirements while simultaneously minimising resource use and environmental impacts.

Tamara Jackson, PhD BAgric (Irr) BAppSc (Hons) GradCertRschMgmt
Postdoctoral Fellow, Water and Energy Analyst
International Centre of Water for Food Security (IC Water)
Locked Bag 588, Building 24, Charles Sturt University
Wagga Wagga NSW 2678, Australia
Web: www.icwater.org, Email: tajackson@csu.edu.au

Archibald Liversidge
Imperial Science under the Southern Cross

Roy MacLeod
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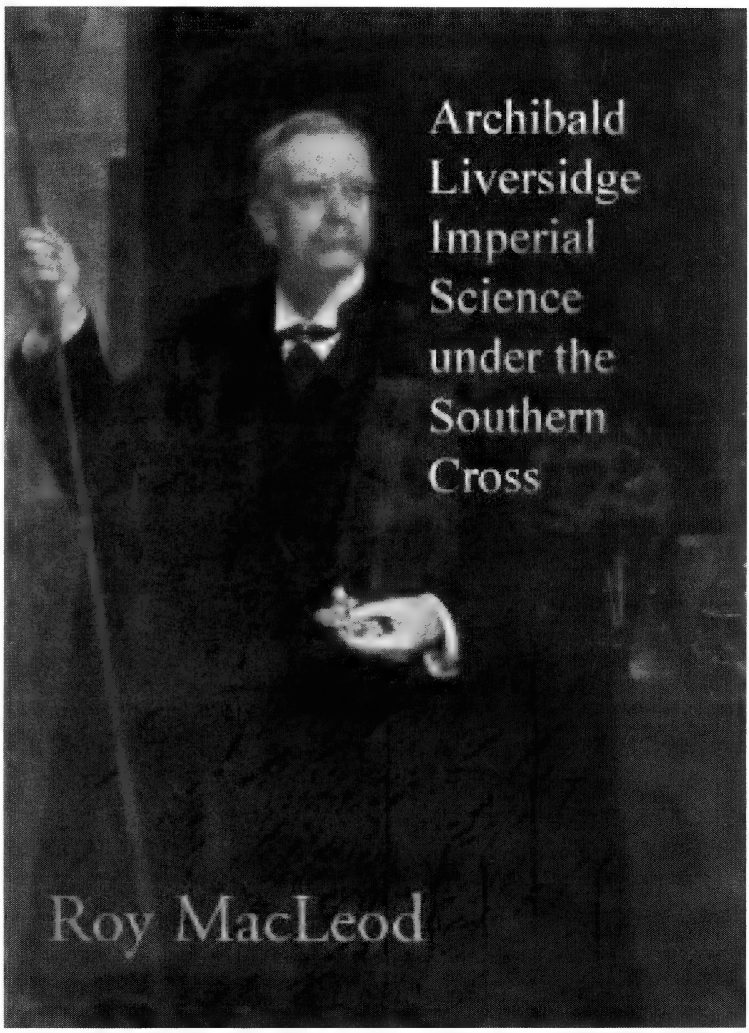
When Archibald Liversidge first arrived at Sydney University in 1872 as reader in Geology and Assistant in the Laboratory he had about ten students and two rooms in the main building. In 1874 he became professor of geology and mineralogy and by 1879 he had persuaded the senate to open a faculty of science. He became its first dean in 1882.



In 1880 he visited Europe as a trustee of the Australian Museum and his report helped to establish the Industrial, Technological and Sanitary Museum which formed the basis of the present Powerhouse Museum's collection. Liversidge also played a major role in the setting up of the Australasian Association for the Advancement of Science which held its first congress in 1888.

For anyone interested in Archibald Liversidge, his contribution to crystallography, mineral chemistry, chemical geology, strategic minerals policy and a wider field of colonial science.

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Archibald Liversidge
Imperial Science under the Southern Cross

by Professor Roy MacLeod

ROY MACLEOD is Professor Emeritus of (Modern) History at the University of Sydney, and an Honorary Associate in the History and Philosophy of Science. He was educated in history, the biochemical sciences, and the history of science at Harvard University (summa cum laude), in sociology at the London School of Economics, and in history and the history of science at Cambridge, where he took the PhD degree in 1967.

He is the author or editor of 22 books and about 120 articles in the social history of science, medicine and technology; military history, museum history, Australian and American history, European history; research policy, and the history of higher education.

Professor Roy MacLeod

Roy MacLeod's most recent book, *Archibald Liversidge: Imperial Science under the Southern Cross* is published by the Royal Society of NSW and Sydney University Press. Liversidge was renowned for his remarkable service to Australian science in the early days of the University of Sydney, where in 1872 he became demonstrator in chemistry and then 'Reader in Geology and Assistant in the Laboratory' and professor of geology and mineralogy in 1874.

One of his greatest contributions was to science education. He worked tirelessly to secure proper recognition of science in both secondary and tertiary education. In the Preface of his book, Professor MacLeod comments: 'Liversidge remained confident that Australia's path would follow the route of the "moving metropolis", strengthened by the bonds that tied Australia to its British heritage. In that heritage lay his life, and through that heritage, flowed the genius of imperial science in New South Wales.'

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